

**Proceedings of 29th Annual Group Meeting of
ICAR-All India Coordinated Research Project on Small Millets**

April 12-13, 2018

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Executive summary

The 29th Annual Group Meeting of ICAR-All India Coordinated Research Project on Small Millets was held at Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh on April 12-13, 2018. About 74 participants from various SAUs, voluntary centers, private companies and other collaborating institutes participated in the group meeting.

The group meeting was held in 8 different sessions spanned over two days. First day started with Inaugural Session. The group meeting was formally inaugurated by Shri Sunil Kumar Kujur, Agriculture production Commissioner, Govt of Chattisgarh under the chairmanship of Dr. IS Solanki, Assistant Director General (FFC), ICAR, New Delhi. Dr. SS Rao, Director of Research Services, IGKV, Raipur welcomed the delegates. Dr. Prabhakar, Project Coordinator (Small Millets), AICRP on Small Millets, ICAR, Bengaluru presented the research highlights of AICRP centers for the year 2017-18. Dr. OP Kashyap, Dean Agriculture, IGKV, Raipur proposed the vote of thanks.

In the afternoon, presentation of progress reports of various disciplines was made by respective Principal Investigators, followed by scientific auditing of each center and the scientists working under the AICRP scheme so that the shortfalls could be identified and addressed effectively. Discipline-wise programme planning group meetings were held to review the results and finalization of technical programmes for the year 2018-19. In the evening Varietal Identification Committee meetings was held under the Chairmanship of Dr. IS Solanki, ADG (FFC), ICAR, New Delhi. Second day was dedicated to presentation of lead topics by distinguished speakers, followed by discussion on various issues related to AICRP activities and collaborative projects and administrative matters. Plenary session was held wherein presentation of session-wise recommendations and the final technical programmes of all disciplines were put for approval of the house. The plenary session was presided over by Dr. IS Solanki, ADG (FFC), ICAR and Dr. SS Rao, Director of Research Services, IGKV; Raipur was the Co-Chairman. Dr. Prabhakar, Project Coordinator (Small Millets) proposed vote of thanks.

Dr. Prabhakar, Project Coordinator (Small millets), Bangalore presented the research highlights of small millets for 2017-18, mentioning that all the six small millets are cultivated in all the states of India. Research work on small millets is going on in 13 AICRP and 21 co-operating centers. The year 2017-18 has been a very fruitful year for the project, since a total of 22 small millet varieties have been released and notified by Central Varietal Release Committee (76th to 79th CVRC meetings). Among them, there are 10 varieties in finger millet, 3 varieties each in foxtail millet and little millet, 2 varieties each in kodo millet, proso millet and barnyard millet. Six varieties are nationally released and 16 are released for different states. Two varieties, one each in proso millet and little millet are identified and yet to be released.

Dr. Prabhakar highlighted the performance of all the entries in six crops of small millets. Performance of AICRP breeding trial in 2017-18 and comparisons of 3 years were presented. Zonal concept was adopted for evaluation of entries only in finger millet along with national, zonal check and local checks. Accordingly, North zone and Southern zones were formulated and continued in 2017-18. Total of nine multi-location yield trials of six millets were conducted across locations. Against total allocation of 121 trials, comprising six millet crops, to various centers all over India, 108 trials were conducted and the overall success was 89.26%. The percent success ranged from 80% in Proso millet to 100% in Barnyard millet. Agronomical recommendations, Front line demonstrations, TSP, drought tolerance accessions of finger millet superior to GPU 28 were presented. Banded leaf blight is becoming major threat in all the small millets and soil application of bio-agents is effective in managing the disease. Scenario of insect pests in small millets and promising varieties with multi pest resistance were highlighted.

During *Kharif 2017-18*, 331 frontline demonstrations (FLDs) on small millets were organized across country. Latest varieties of small millets were demonstrated along with locally cultivar as a check in farmers' fields at different locations. The demonstrated varieties of finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet gave 54.83%, 60.43%, 47.29%, 57.07%, 67.08%, 71.59%, 74.28%, 44.96%, 106.76%, 80.61%, 154.32% and 107.33% higher grain and fodder yields respectively than the local checks.

Programme under Tribal sub plan resulted in introduction of finger millet in tribal populations for cultivation and also consumption. The TSP programme was carried out in five centres and the total area covered was 51.6 ha with 109 beneficiaries. For popularization of small millets in NEH Region, a total of Rs. 40.48 lakhs has been allocated three centres, for conduct of demonstration in farmer's fields in summer and kharif 2017 and summer 2018.

Against the indent, breeder seed allocation of 58.10q was made for production across 12 centres in 9 states. Accordingly, the total production of breeder seed was 67.13q and it is 201.89 % more than the allocation. A total of 448.0 kgs of nucleus seed of varieties of 85 varieties of 6 crops of small millets were produced by 17 centres.

Dr. I.S. Solanki, ADG (F&FC) ICAR New Delhi in his address first thanked the University authorities for providing the facilities to conduct the 29th Annual Group Meeting of Small Millets. He expressed his concern to for losing the area under small millets year after year and more than 50% area has been lost under finger millet and more than 7.5 times of area was lost under other small millet crops. However, he has also highlighted that, even though decrease in area the per unit or per hectare productivity is increased that is because of the different technologies developed by the scientist and collective efforts of farmers.

Dr. Solanki further mentioned that Government of India declared 2018 as a year of millet as the millets having nutritional quality and these crops are growing good under variable climatic conditions. These crops are early maturing and give sustainable yield under and richest source of calcium and other minerals. He also emphasized that, the number of varieties under these small millet crops are not sufficient, most of the farmers are growing land races available with them. We have to make big efforts for popularization and the adoption of new varieties and technologies developed so far. We have to regain the lost area under small millets. Value addition and milling of millets machinery required for millets is important aspect to boost the production.

Shri. Sunil Kumar Kujur, IAS, Agriculture, Production Commissioner Govt. of Chhatisgarh in his presidential remarks highlighted that we should work for the benefits for the farmers. Farmers' income should be increased or we should make efforts for doubling the farmers' income. Now a day the market strategies is becoming difficult in that case we have to help the farmers for their production. The concrete recommendation should emerge for the benefits of farmer from this workshop.

Discipline-wise research highlights

Development of improved varieties of small millets

The year 2017-18 has been a very fruitful year for the project, since a total of 22 small millet varieties have been released and notified by Central Varietal Release Committee (76th to 79th CVRC meetings). Among them, there are 10 varieties in finger millet, 3 varieties each in foxtail millet and little millet, 2 varieties each in kodo millet, proso millet and barnyard millet. Six varieties are nationally released and 16 are released for different states. Two varieties, one each in proso millet and little millet are identified and yet to be released.

Breeding

- Applied researches dealt with multi-location yield trials. Basic and strategic researches focused on various aspects including development of high yielding varieties of all six millets with tolerance to diseases and insect-pests, etc.
- Zonal concept was adopted for evaluation of entries only in finger millet along with national, zonal check and local checks. Accordingly, North zone and Southern zones were formulated and continued in 2017-18.
- Total of nine multi-location yield trials of six millets were conducted across locations. Against total allocation of 121 trials, comprising six millet crops, to various centers all over India, 108 trials were conducted and the overall success was 89.26%. The percent success ranged from 80% in Proso millet to 100% in Barnyard millet.

I. Multi-location Trials

Against total allocation of 121 trials, comprising six millet crops, to various centers all over India, 108 trials were conducted and the overall success was 89.26%. The percent success ranged from 80% in Proso millet to 100% in Barnyard millet.

Finger millet Initial Varietal Trial- South zone: The entry FMV 1117 was superior by 24.81% over the check VL 352, 11.02% over the check GPU 45 and 4.55% over the check PR 202 in grain yield and on par with best check GPU 67. The entry FMV 1118 gave 24.42% & 10.12% more grain yield than VL 352 and GPU 45, respectively, but inferior to best check GPU 67. The entries FMV 1130 & FMV 1116 were on par with GPU 67 in fodder yield.

Finger millet Initial Varietal Trial- North zone: The entry FMV 1119 was performed significantly superior than the best check GPU 67 for fodder yield in the trial. FMV 1116, FMV 1113, FMV 1118 and FMV 1112 were superior to the best check. The entry FMV 1116 was superior by 5.14% grain yield over the best check GPU 67 and 8.09% over the check PR 202, 7.04% over the check GPU 45 then 6.91% over the check VL 352.

Finger millet Advanced Varietal Trial- Early & Medium (AVT I & II) duration: South zone: The varietal performance of finger millet varieties over three years of testing indicated that FMV1101 was 9.58% superior in grain yield over the best check, but it gave less fodder yield (-7.11) over the best check GPU 45. In two year performance of varieties, entry FMV1106 gave 4.18% more grain yield than the best check VL 352 but it gave less fodder yield than the best check GPU45.

Finger millet Advanced Varietal Trial- Early & Medium (AVT I & II) duration: North zone.: The entry FMV 1102 and FMV 1101 gave more than 20% grain yield than checks GPU 45, GPU 67 and PR 202 and more than 10% grain yield over check VL 352.

Foxtail millet Initial and Advanced Varietal Trial (FIAVT): The entries FXV 603 and FXV 602 were superior by 6.95% & 4.0% over the check SiA 326 in grain yield, but inferior to check SiA 3156 by 1.4%& 4.62%, respectively. The entry FXV 603 was superior by 11.36% in fodder yield over the best check SiA 326. The entries FXV 607 and FXV 612 were superior over the best check by 9.01% and 8.65%, respectively. The varietal performance of foxtail millet entries over 3 and 2 years of testing indicated that none of the entries were superior over the checks. But the entry FXV601 gave more fodder yield of 3.39% over best check SiA326 over 3 years performance. Over 2 years performance the entry FXV603 gave 4.63% more fodder yield than the best check SiA 326.

Kodo millet Initial and Advanced Varietal Trial: The varietal performance of Kodo millet varieties over two years of testing indicated that two entries KMV542 (19.22%) and KMV543 (18.35%) gave more grain yield than the best check TNAU86. In fodder yield the entry KMV542 gave higher fodder yield of 12.29% over best check TNAU86 and KMV543 gave 1.55% increased fodder yield over best check.

Little millet Initial and Advanced Varietal Trial: The varietal performance of Little millet varieties over three years of testing indicated that the entry LMV511 gave higher yield of 2.55% over the best check and was on par with the check for fodder yield. In two years performance of varieties, LMV513 was 8.33% superior in grain yield over the best check and LMV512 gave 4.3% more grain yield than best check. But both the entries LMV512 and LMV513 gave less fodder yield than the best check.

Barnyard millet Initial and Advanced Varietal Trial: The varietal performance of Barnyard millet varieties over three years of testing indicated that the entry BMV 581 gave higher yield of 8.36% over the best check and was on par with the check for fodder yield. In two years performance of varieties, BMV 582 was on par with the best check in grain yield and superior by 16.98% in fodder yield over best check.

Proso millet Initial and Advanced Varietal Trial: The varietal performance of Proso millet varieties over two years of testing indicated that the entry PMV 441 gave higher yield of 5.57% over the check and superior by 3.01% in fodder yield over best check. PMV 442 gave more grain yield than check but inferior to check in fodder yield than check.

Nucleus and Breeder seed production: Against the indent, breeder seed allocation of 58.10q was made for production across 12 centres in 9 states. Accordingly, the total production of breeder seed was 67.13q and it is 201.89 % more than the allocation. A total of 448.0 kgs of nucleus seed of varieties of 85 varieties of 6 crops of small millets (finger millet-48, kodo millet-17, 7 each of foxtail millet and little millet, and 3 each of barnyard millet and proso millet) were produced by 17 centres. The varieties included the old and newly released by centres over the years

Agronomy

Evaluation of pre- released genotypes to fertility levels: 100 per cent recommended dose of fertilizer was found optimum to realize higher yields in Finger millet, Foxtail millet, Little millet and Barnyard millet. The test variety VL 386 (Finger millet), SiA 3156 and test variety DHFT 5-6 (Foxtail millet), OLM-203, BL 6 and DLM 95 (Little millet) were found superior to other varieties tested in respective centre respectively.

Nutrient management in small millets: Seed pelleting with biofertilizers, micronutrients along with 100 per cent RDF application was found best to enhance finger millet production. Under irrigated condition, application of 75 and 100 per cent recommended dose of fertilizers through briquettes improved productivity and profitability of finger millet

Assessing the performance of small millets to different sowing windows: Normal sowing was found best for Kodo, little, foxtail and barnyard millet followed by early sowing. Need based agronomic management practices are necessary to tackle mid and late season drought to increase productivity and moisture conservation

Weed management for small millets: Standard cultural practice *i.e.*, two inter cultivations along with one hand weeding improved finger millet productivity and the best chemical weed management practice was pre emergence application of Isoproturon @ 0.5 kg a.i. / ha along with one inter-cultivation for rainfed condition and pre emergence application of Oxyflurofen @ 0.10 lit a.i./ha along with one inter-cultivation for irrigated condition

Millet based cropping systems for sustainable productivity: Finger millet + Guar (8:2), Finger millet + Bhendi (8:2), Finger millet + Amaranthus (90:10 by weight), Foxtail millet + Redgram(5:1), Little millet + Niger (4:1), Barnyard millet + Niger(4:1) and cropping sequence Barnyard millet + Rice bean (90:10) - wheat are possible intercropping systems and cropping sequence for enhancing crop productivity and profitability.

Plant Pathology

Survey and Surveillance: Survey and surveillance of farmers field was conducted in six centers *viz.*, Athiyandal, Mandya, Jagdalpur, Ranchi, Ranichauri and Vizianagaram for finger millet diseases and at Nandyal for foxtail millet, at Ranichauri for Barnyard millet, at Rewa for little millet and kodo millet diseases. Finger blast was recorded as high as up to 36.67 per cent at Ranchi, 32 per cent at Ranichauri and 31 per cent at Mandya in farmers field, mostly on local varieties. Neck blast was recorded up to 18.33 per cent at Ranchi, 22 per cent at Ranichauri.

In foxtail millet leaf blast was recorded as high as five grades in Suryanandi variety in Nandyal. Leaf shredding phase of downy mildew also observed in most of the farmers fields. In little millet grain smut (0-28 %) and banded blight (0-21.5 %) was recorded high at Rewa. Grain smut (0-42 %), head smut (0-4 %) and sheath blight (0-20.6 %) was recorded in barnyard millet at Ranichauri area. In Kodo millet, head smut (0-7.0%), banded blight (0-26 %) and non-parasitic disease/Phanerogamic parasite *Striga* spp. infection was also noticed up to 12.5 per cent in Sindhi district, Rewa, M.P. state.

Finger millet Initial Varietal Trial (FIVT): Blast incidence ranges from low to high in different locations. Range of diseases in different varieties were: leaf blast 2.89 to 5.39, neck blast 19.99 to 69.04 per cent, finger blast 18.2 to 54.36 per cent. Resistant lines for banded blight were tested in three hotspot locations viz., Jagdalpur, Ranchi and Rewa. Among three locations at Rewa the incidence of banded blight was highest (45.1%), however, at Ranchi (28.33 %) and Jagdalpur (13 %) the incidence was moderate.

Eco-friendly management of banded blight in six small millets: Continuously for two years, eco-friendly management of banded blight trials were conducted over five locations and in all six small millets, soil application of value added *Pseudomonas fluorescence* + *Trichoderma viride* + *Bacillus subtilis* not only minimized the disease but also enhanced grain and fodder yield.

Agricultural Entomology

Pest scenario in small millets: In finger millet, the grasshopper is a major biotic constraint followed by the Pink stem borer (*Sesamia inferens*), Aphids (leaf aphid and panicle aphid), *Myloccerus* weevil and ear head caterpillar, *Helicoverpa armigera* etc. During Kharif 2017, Bangalore centre scientists surveyed for outbreak of defoliators noticed in these places. Defoliators include armyworm, leaf folders and semiloopers in five districts were Chikkaballapur, Kolar, Bangalore rural, Bangalore urban and Tumkur districts.

Technology Recommendations for Package of practice

Little millet three year pooled data revealed that spraying of 1500ppm azadirachtin at 15 DAS reduced the incidence of shoot fly (6.4 %) followed by spraying of 5 % NSKE 15 DAS (7.54 %). However, Control plot recorded higher dead heart 17.06 per cent

Proso millet three year pooled revealed that per cent dead heart noticed in 20 and 30 days after seedling emergence was very low in treatment sprayed with 1500 ppm azadirachtin at 15 DAS followed by early sowing before the normal sowing. The highest yield in treatment spraying of 1500ppm azadirachtin and spraying of NSKE at 5 % 15 DAS treatment recorded 4.09 and 3.80 quintal per hectare, respectively.

Shoot fly was the major pest on other millets (viz., kodo, little, proso, foxtail, barnyard millet and brown top millet at five different centres. Survey was carried out during June and September month to know the incidence of shoot fly in millet growing areas. Field survey carried out at two agricultural research stations namely Arasikere and Tiptur. The deadheart caused by shoot fly ranges from 7.5 to 30 per cent noticed in barnyard and little millet, respectively. However, at ARS, Tiptur recorded the deadheart ranges from 2 to 22.8 per cent.

Brown top millet affected by shoot fly at Hemdore (sira-taluk) 2-3 deadheart per m². (Ranchi (Jarkhand) found to be the hot spot for Kodo millet shoot fly. Among the centres, Ranchi and Bangalore recorded high per cent little millet shoot fly incidence. Ranchi Bangalore found to be the hot spot for prosomillet shoot fly. For the first time noticed the stem borer in Ranichauri on barnyard millet. This year introduced new crop i.e browntop millet, *Bracharia ramosa*, was only screened at PC unit, Bangalore.

Six different dates of sowing: The per cent deadheart caused by shoot fly was higher in July and August in particular during early stage of the crop. Late sowing harbors the shoot fly incidence.

Frontline demonstrations

During *Kharif 2017-18*, 331 frontline demonstrations (FLDs) on small millets were organized across country viz., Andhra Pradesh, Chattisgarh, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttarakhand on farmer's fields. Latest varieties of small millets were demonstrated along with locally cultivar as a check in farmers' fields at different locations. The demonstrated varieties of finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet gave 54.83%, 60.43%, 47.29%, 57.07%, 67.08%, 71.59%, 74.28%, 44.96%, 106.76%, 80.61%, 154.32% and 107.33% higher grain and fodder yields respectively than the local checks.

Tribal Sub Plan: Programme under Tribal sub plan resulted in introduction of finger millet in tribal populations for cultivation and also consumption. The tribal population in different small millets growing states is encouraged both in physical and financial terms by facilitating small millets cultivation and increasing production and consumption by providing them with improved varieties and also required inputs and implements. The TSP programme was carried out in five centres viz., Jagdalpur, Athiyandal, Dindori, Mandya and Vizianagaram. An amount of Rs. 5.00 lakhs was released to different centres during the year 2017-18. The total area covered was 51.6 ha with 109 beneficiaries.

Popularization of small millets in NEH Region

- A total of Rs. 40.48 lakhs has been allocated three centres, viz. Gossaigaon in Assam, Agartala in Tripura and Namthumg, Sikkim to popularise the small millets in NEH region by way of conducting demonstration in farmer's fields in summer and kharif 2017 and summer 2018.
- The improvement in demonstrations of foxtail millet during Rabi2016-17 in Assam (Gossaigaon) was 107.83% and that of demonstrations of finger millet in Kharif 2017 was 74.50%. A total of 165 farmers are benefitted through demonstrations.
- Popularizing cultivation of finger Millet under rain fed condition of Tripura, 50.0 ha area has been identified and conducted front Line demonstrations in 8 districts and 3 KVKs across Tripura. Latest Varieties of Finger Millet (KMR-301 and KMR-204) were demonstrated in farmer's fields.

Recommendations

1. Barnyard millet variety DHBM-23-3, which was superior to checks for grain and fodder yield with higher zinc, iron and protein content is identified for release in Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu.
2. There should be an exchange the genetic material freely among the scientists hasten the millet varietal developmental process.
3. It is suggested to deploy MAS, allele mining and pre-breeding for developing new varieties.
4. Work on post harvest technology should be started for better milling or processing the millets
5. It has been decided to continue Rewa center as voluntary centre and Project Coordinator would provide some contingencies for seed production activities and any specific trials. Both Rewa and Dindori centre will take up breeder and nucleus seed production in little millet and kodo millet.
6. Sharing of breeding materials among different centers should continue and all the breeders and specifically those breeders who did not contribute last year should share breeding materials this year.
7. Guidelines in breeder seed production must be strictly followed by each Breeder and they have to send BSP-II, BSP-III, BSP-IV and BSP-V information to PC, ADG and Seed Division, Ministry of Agriculture & Farmers Welfare as mentioned in the BSP-I (Allocation of Breeder seed of varieties by PC).
8. Finger millet based intercropping System (Finger millet + Amaranthus 90:10) was the most profitable system.
9. Seed rate of 15 kg/ha along with one intercultural operation at 20 DAS and one hand weeding at 40 DAS is recommended for higher grain yield of Barnyard Millet under Rainfed condition.
10. Barnyard millet based intercropping System (Barnyard millet + Amaranthus 4:1) was the most promising intercropping System.
11. Finger millet + Guar (8: 2) and Finger millet + Bendi (8:2) intercropping systems were found to be profitable.
12. For best weed management practice under rainfed condition and to obtain higher yield, two inter-cultivation along with one hand weeding followed by Pre-emergence application of Isoproturon @0.5 kg a.i./ha along with one inter-cultivation is recommended. Under irrigated conditions, application of Bensulfuron methyl + Pretilachlor @0.198 kg/ha as pre emergent herbicide is recommended.
13. As we have susceptible and resistant checks available for various diseases, all the breeding materials should be screened against the identified susceptible and resistant checks for various diseases.
14. There is a need to screen all breeding materials and germplasm for identifying susceptible and resistant checks for various insect-pests. Already available checks should be used for screening against insect-pests.
15. For low cost management of shoot fly in little millet, spraying of 1500ppm azadirachtin (0.15 per cent) (4 ml/litre of water) at 15 DAS is recommended to reduce the incidence of Shoot fly, where as for low cost management of shoot fly in Proso millet, spraying with 1500 ppm azadirachtin (0.15 per cent) (4 ml/litre of water) at 15 DAS followed by early sowing before the normal sowing is recommended.
16. Collected specimens of all insect pests of small millets should be sent to main centre for identification.(Predators/parasitoids/ spiders to be identified from taxonomists.
17. For analyzing nutritional parameters, scientists are requested to collaborate with concerned universities, ICAR-IIMR, Hyderabad and NIN, Hyderabad.
18. The soil application of value added Pseudomonas fluorescens + Trichoderma asperellum + Bacillus subtilis @1 kg each talc formulation mixed in 25 kg FYM or Vermicompost incubated for 15 days is recommended for management of banded sheath blight in all the six millets.

Part A: Proceedings of technical sessions

Session I: Inaugural session

- Chairman : Dr. I.S Solanki, ADG (F and FC) ICAR, New Delhi
- Chief Guest : Shri. Sunil Kumar Kujur, IAS, Agriculture Production Commissioner, Govt. of Chhatisgarh
- Rapporteurs : Dr. R.D. Nigade, Officer In-charge and Junior Agronomist, ZARS, Kolhapur (M.S)
: Dr. Laxmi Rawat, Officer In-charge and Jr. Pathologist, Hill Campus, Ranichauri (Uttarakhand)

Inaugural session of 29th Annual Group Meeting started with the "Saraswati Poojan" and lighting of the ceremonial lamp by all dignitaries on the dais. At the outset, Dr. S.S. Rao, Director of Research Services, IGKV, Raipur welcomed all the dignitaries and delegates to the 29th Annual Group Meeting. He expressed his thanks for choosing this institute as venue for holding the 29th Annual Group Meeting. He briefed about the advanced facilities and activities going on in IGKV, Raipur in general and research work done so far and research activities going on in respect of Small Millets in particular. He specially mentioned Chhatisgarh state as Organic State by Govt. of India and importance of small millets grown in state. He highlighted the varieties and technologies developed by IGKV, Raipur for the benefits of Chhatisgarh farmers and farming community.

Dr. Prabhakar, Project Coordinator (Small millets), Bangalore presented the research highlights of small millets for 2017-18, mentioning that all the six small millets are cultivated in all the states of India. Research work on small millets is going on in 13 AICRP and 21 co-operating centers. The year 2017-18 has been a very fruitful year for the project, since a total of 22 small millet varieties have been released and notified by Central Varietal Release Committee (76th to 79th CVRC meetings). Among them, there are 10 varieties in finger millet, 3 varieties each in foxtail millet and little millet, 2 varieties each in kodo millet, proso millet and barnyard millet. Six varieties are nationally released and 16 are released for different states. Two varieties, one each in proso millet and little millet are identified and yet to be released.

Dr. Prabhakar highlighted the performance of all the entries in six crops of small millets. Performance of AICRP breeding trial in 2017-18 and comparisons of 3 years were presented. Zonal concept was adopted for evaluation of entries only in finger millet along with national, zonal check and local checks. Accordingly, North zone and Southern zones were formulated and continued in 2017-18. Total of nine multi-location yield trials of six millets were conducted across locations. Against total allocation of 121 trials, comprising six millet crops, to various centers all over India, 108 trials were conducted and the overall success was 89.26%. The percent success ranged from 80% in Proso millet to 100% in Barnyard millet. Agronomical recommendations, Front line demonstrations, TSP, drought tolerance accessions of finger millet superior to GPU 28 were presented. Banded leaf blight is becoming major threat in all the small millets and soil application of bio-agents is effective in managing the disease. Scenario of insect pests in small millets and promising varieties with multi pest resistance were highlighted.

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He has suggested the importance of crossing programme for improvement in productivity. He has also emphasized on the importance of nucleus and breeder seed production implemented by different centers and their seed production targets. Further, he has announced the inclusion of a new small millet crop namely "Brown Top Millet". The regular research programme will be formulated from *kharif* 2018 onwards for detailed study of the new crop brown top millet.

Dr. I.S. Solanki, ADG (F&FC) ICAR New Delhi in his address first thanked the University authorities for providing the facilities to conduct the 29th Annual Group Meeting of Small Millets. He expressed his concern to for losing the area under small millets year after year and more than 50% area has been lost under finger millet and more than 7.5 times of area was lost under other small millet crops. However, he has also highlighted that, even though decrease in area the per unit or per hectare productivity is increased that is because of the different technologies developed by the scientist and collective efforts of farmers.

Dr. Solanki further mentioned that Government of India declared 2018 as a year of millet as the millets having nutritional quality and these crops are growing good under variable climatic conditions. These crops are early maturing and give sustainable yield under and richest source of calcium and other minerals. He also emphasized that, the number of varieties under these small millet crops are not sufficient, most of the farmers are growing land races available with them. We have to make big efforts for popularization and the adoption of new varieties and technologies developed so far. We have to regain the loosed area under small millets. Value addition and milling of millets machinery required for millets is important aspect to boost the production.

Thereafter 17 publications and one book related to small millets from different centers were released on this occasion by the dignitaries. Important publications are as follows

1. Text Book on Diseases of Small Millets by TSSK Patro *et. al.* (Viziangaram centre)
2. Small Millet Insect pests by Prabhu Ganiger *et.al.* (PC Unit, Bengaluru)
3. Production, processing and value addition in Small Millets in Hindi by SC Yadav *et. al.* (Jagdalpur Centre)
4. Improved production Technology in Ragi and Little millet in Gujarati by Harshal Patil *et.al.* (Waghai centre)
5. The Oriental Armyworm and its Management by Prabhu Ganiger *et.al.* (PC Unit, Bengaluru).

Shri. Sunil Kumar Kujur, IAS, Agriculture, Production Commissioner Govt. of Chhatisgarh in his presidential remarks highlighted that we should work for the benefits for the farmers. Farmers' income should be increased or we should make efforts for doubling the farmers' income. Now a day the market strategies is becoming difficult in that case we have to help the farmers for their production. The concrete recommendation should emerge for the benefits of farmer from this workshop.

Four farming groups from Bastar districts of Chhatisgarh were facilitated for their valuable work in small millets value addition and processing of millets by the dignitaries.

At the end Dr. O.P. Kashyap Dean, IGKV, Raipur has proposed vote of thanks and with this the inaugural session came to an end.

Session II: Presentation of Progress Report: 2017-18

Chairman:	Dr. I. S. Solanki, ADG (F & FC)
Co-chairman:	Dr. Prabhakar, Project Coordinator (SM)
Rapporteurs:	Drs. D C Joshi and Sunil Karad

At the outset, the Chairman and Co-chairman welcomed all the delegates and invited the Principal Investigators of the project for presentation of research highlights. The research highlights were presented by Dr. CR Ravishankar (PI-Breeding), Dr TS Sukanya (PI-Agronomy and FLDs), Dr. TSSK Patro (PI-Plant Pathology), Dr Prabhu C. Ganiger (PI-Entomology), Dr TV Krishna (Seed production) and Dr. KB Palanna (TSP & NEH programmes).

Dr Ravishankar presented the research highlights of breeding as below

- Against total allocation of 121 trials, comprising six millet crops, to various centers all over India, 108 trials were conducted and the overall success was 89.26%. The percent success ranged from 80% in Proso millet to 100% in Barnyard millet.
- Finger millet Initial Varietal Trial- South zone: The entry FMV 1117 was superior by 24.81% over the check VL 352, 11.02% over the check GPU 45 and 4.55% over the check PR 202 in grain yield and on par with best check GPU 67. The entry FMV 1118 gave 24.42% & 10.12% more grain yield than VL 352 and GPU 45, respectively, but inferior to best check GPU 67. The entries FMV 1130 & FMV 1116 were on par with GPU 67 in fodder yield.
- Finger millet Initial Varietal Trial- North zone: The entry FMV 1119 was performed significantly superior than the best check GPU 67 for fodder yield in the trial. FMV 1116, FMV 1113, FMV 1118 and FMV 1112 were superior to the best check. The entry FMV 1116 was superior by 5.14% grain yield over the best check GPU 67 and 8.09% over the check PR 202, 7.04% over the check GPU 45 then 6.91% over the check VL 352.
- Finger millet Advanced Varietal Trial- Early & Medium (AVT I & II) duration: South zone: The varietal performance of finger millet varieties over three years of testing indicated that FMV1101 was 9.58% superior in grain yield over the best check, but it gave less fodder yield (-7.11) over the best check GPU 45. In two year performance of varieties, entry FMV1106 gave 4.18% more grain yield than the best check VL 352 but it gave less fodder yield than the best check GPU45.
- Finger millet Advanced Varietal Trial- Early & Medium (AVT I & II) duration: North zone.: The entry FMV 1102 and FMV 1101 gave more than 20% grain yield than checks GPU 45, GPU 67 and PR 202 and more than 10% grain yield over check VL 352.
- Foxtail millet Initial and Advanced Varietal Trial (FIAVT): The entries FXV 603 and FXV 602 were superior by 6.95% & 4.0% over the check SiA 326 in grain yield, but inferior to check SiA 3156 by 1.4%& 4.62%, respectively. The entry FXV 603 was superior by 11.36% in fodder yield over the best check SiA 326. The entries FXV 607 and FXV 612 were superior over the best check by 9.01% and 8.65%, respectively. The varietal performance of foxtail millet entries over 3 and 2 years of testing indicated that none of the entries were superior over the checks. But the entry FXV601 gave more fodder yield of 3.39% over best check SiA326 over 3 years performance. Over 2 years performance the entry FXV603 gave 4.63% more fodder yield than the best check SiA 326.
- Kodo millet Initial and Advanced Varietal Trial: The varietal performance of Kodo millet varieties over two years of testing indicated that two entries KMV542 (19.22%) and KMV543 (18.35%) gave more grain yield than the best check TNAU86. In fodder yield the entry KMV542 gave higher fodder yield of 12.29% over best check TNAU86 and KMV543 gave 1.55% increased fodder yield over best check.

- Little millet Initial and Advanced Varietal Trial: The varietal performance of Little millet varieties over three years of testing indicated that the entry LMV511 gave higher yield of 2.55% over the best check and was on par with the check for fodder yield. In two years performance of varieties, LMV513 was 8.33% superior in grain yield over the best check and LMV512 gave 4.3% more grain yield than best check. But both the entries LMV512 and LMV513 gave less fodder yield than the best check.
- Barnyard millet Initial and Advanced Varietal Trial: The varietal performance of Barnyard millet varieties over three years of testing indicated that the entry BMV 581 gave higher yield of 8.36% over the best check and was on par with the check for fodder yield. In two years performance of varieties, BMV 582 was on par with the best check in grain yield and superior by 16.98% in fodder yield over best check.
- Proso millet Initial and Advanced Varietal Trial: The varietal performance of Proso millet varieties over two years of testing indicated that the entry PMV 441 gave higher yield of 5.57% over the check and superior by 3.01% in fodder yield over best check. PMV 442 gave more grain yield than check but inferior to check in fodder yield than check.

Remarks

- The percentage of execution of coordinated trials in small millets is above 85%. It needs to be enhanced for getting better results.
- Voluntary centers are advised for timely submission of the data otherwise trials will not be allotted to them.

Dr. TV Krishna presented the research highlights of seed production as below

- Against the indent, breeder seed allocation of 58.10q was made for production across 12 centres in 9 states. Accordingly, the total production of breeder seed was 67.13q and it is 201.89 % more than the allocation.
- A total of 448.0 kgs of nucleus seed of varieties of 85 varieties of 6 crops of small millets (finger millet-48, kodo millet-17, 7 each of foxtail millet and little millet, and 3 each of barnyard millet and proso millet) were produced by 17 centres.
- The varieties included the old and newly released by centres over the years

Remarks

- Chairman appreciated the surplus amount of breeder seed produced as compared to the indent. He also suggested quality issues must be considered especially in breeder seed production.
- Information on state wise adoption of released varieties by the farmers should be compiled by the breeders.

Dr. TS. Sukanya presented the research highlights of Agronomy and Frontline demonstrations as below

- Evaluation of pre- released genotypes to fertility levels: 100 per cent recommended dose of fertilizer was found optimum to realize higher yields in Finger millet, Foxtail millet, Little millet and Barnyard millet . The test variety VL 386 (Finger millet), SiA 3156 and test variety DHFT 5-6 (Foxtail millet), OLM-203, BL 6 and DLM 95 (Little millet) were found superior to other varieties tested in respective centre respectively.
- Nutrient management in small millets: Seed pelleting with biofertilizers, micronutrients along with 100 per cent RDF application was found best to enhance finger millet production. Under irrigated condition, application of 75 and 100 per cent recommended dose of fertilizers through briquettes improved productivity and profitability of finger millet
- Assessing the performance of small millets to different sowing windows: Normal sowing was found best for Kodo, little, foxtail and barnyard millet followed by early sowing. Need based agronomic management practices are necessary to tackle mid and late season drought to increase productivity and moisture conservation

- Weed management for small millets : Standard cultural practice *i.e.*, two inter cultivations along with one hand weeding improved finger millet productivity and the best chemical weed management practice was pre emergence application of Isoproturon @ 0.5 kg a.i. / ha along with one intercultivation for rainfed condition and pre emergence application of Oxyflufen @ 0.10 lit a.i/ha along with one intercultivation for irrigated condition
- Millet based cropping systems for sustainable productivity: Finger millet + Guar (8:2), Finger millet + Bhendi (8:2), Finger millet + Amaranthus (90:10 by weight), Foxtail millet + Redgram(5:1), Little millet + Niger (4:1), Barnyard millet + Niger(4:1) and cropping sequence Barnyard millet + Rice bean (90:10) - wheat are possible intercropping systems and cropping sequence for enhancing crop productivity and profitability.
- During *Kharif 2017-18*, 331 frontline demonstrations (FLDs) on small millets were organized across country *viz.*, Andhra Pradesh, Chattisgarh, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttarakhand on farmer's fields. Latest varieties of small millets were demonstrated along with locally cultivar as a check in farmers' fields at different locations. The demonstrated varieties of finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet gave 54.83%, 60.43%, 47.29%, 57.07%, 67.08%, 71.59%, 74.28%, 44.96%, 106.76%, 80.61%, 154.32% and 107.33% higher grain and fodder yields respectively than the local checks.

Remarks

- There is a need to search for a better alternative of isoproteuron for weed management in kodo millet.
- For TSP/FLD information regarding mobile number, Aadhar number should be recorded for all the beneficiaries.

Dr. TSSK Patro presented the research highlights of Plant Pathology as below

- Survey and Surveillance: Survey and surveillance of farmers field was conducted in six centers *viz.*, Athiyandal, Mandya, Jagdalpur, Ranchi, Ranichauri and Vizianagaram for finger millet diseases and at Nandyal for foxtail millet, at Ranichauri for Barnyard millet, at Rewa for little millet and kodo millet diseases. Finger blast was recorded as high as up to 36.67 per cent at Ranchi, 32 per cent at Ranichauri and 31 per cent at Mandya in farmers field, mostly on local varieties.
- Neck blast was recorded up to 18.33 per cent at Ranchi, 22 per cent at Ranichauri. In foxtail millet leaf blast was recorded as high as five grades in Suryanandi variety in Nandyal. Leaf shredding phase of downy mildew also observed in most of the farmers fields. In little millet grain smut (0-28 %) and banded blight (0-21.5 %) was recorded high at Rewa. Grain smut (0-42 %), head smut (0-4 %) and sheath blight (0-20.6 %) was recorded in barnyard millet at Ranichauri area.
- In Kodo millet, head smut (0-7.0%), banded blight (0-26 %) and non-parasitic disease/Phanerogamic parasite *Striga* spp. infection was also noticed up to 12.5 per cent in Sindhi district, Rewa, M.P. state.
- Finger millet Initial Varietal Trial (FIVT): Blast incidence ranges from low to high in different locations. Range of diseases in different varieties was: leaf blast 2.89 to 5.39, neck blast 19.99 to 69.04 per cent, and finger blast 18.2 to 54.36 per cent. Resistant lines for banded blight were tested in three hotspot locations *viz.*, Jagdalpur, Ranchi and Rewa. Among three locations at Rewa the incidence of banded blight was highest (45.1%), however, at Ranchi (28.33 %) and Jagadalpur (13 %) the incidence was moderate.
- Eco-friendly management of banded blight in six small millets: Continuously for two years, ecofriendly management of banded blight trials were conducted over five locations and in all six small millets, soil application of value added *Pseudomonas fluorescence* + *Trichoderma viride* + *Bacillus subtilis* not only minimized the disease but also enhanced grain and fodder yield.

Remarks

- Origin of the entries tested for disease reaction in different trials should be recorded by pathologists.
- Resistant lines identified in disease screening nurseries should be utilized in hybridization program by the breeders.

- Resistant lines completed four year of testing in AICRP trials should be registered with NBPGR as novel genetic stock.
- As we have already susceptible and resistant checks for various diseases, all the breeding materials should be screened against the identified susceptible and resistant checks for all the diseases.

Dr. Prabhu C. Ganiger presented the research highlights of Agricultural Entomology as below

- Pest scenario in small millets: In finger millet, the grasshopper is a major biotic constraint followed by the Pink stem borer (*Sesamia inferens*), Aphids (leaf aphid and panicle aphid), *Myloccerus* weevil and ear head caterpillar, *Helicoverpa armigera* etc. During Kharif 2017, Bangalore centre scientists surveyed for outbreak of defoliators noticed in these places. Defoliators include armyworm, leaf folders and semiloopers in five districts were Chikkaballapur, Kolar, Bangalore rural, Bangalore urban and Tumkur districts.
- Little millet three year pooled data revealed that spraying of 1500ppm azadirachtin at 15 DAS reduced the incidence of shoot fly (6.4 %) followed by spraying of 5 % NSKE 15 DAS (7.54 %). However, Control plot recorded higher dead heart 17.06 per cent
- Proso millet three year pooled revealed that per cent dead heart noticed in 20 and 30 days after seedling emergence was very low in treatment sprayed with 1500 ppm azadirachtin at 15 DAS followed by early sowing before the normal sowing. The highest yield in treatment spraying of 1500ppm azadirachtin and spraying of NSKE at 5 % 15 DAS treatment recorded 4.09 and 3.80 quintal per hectare, respectively.
- Shoot fly was the major pest on other millets (viz., kodo, little, proso, foxtail, barnyard millet and brown top millet at five different centres. Survey was carried out during June and September month to know the incidence of shoot fly in millet growing areas.
- Field survey carried out at two agricultural research stations namely Arasikere and Tiptur. The deadheart caused by shoot fly ranges from 7.5 to 30 per cent noticed in barnyard and little millet, respectively. However, at ARS, Tiptur recorded the deadheart ranges from 2 to 22.8 per cent.
- Brown top millet affected by shoot fly at Hemdore (sira-taluk) 2-3 deadheart per m². (Ranchi (Jarkhand) found to be the hot spot for Kodo millet shoot fly. Among the centres, Ranchi and Bangalore recorded high per cent little millet shoot fly incidence. Ranchi Bangalore found to be the hot spot for prosomillet shoot fly.
- For the first time noticed the stem borer in Ranichauri on barnyard millet. This year introduced new crop i.e browntop millet, *Bracheria ramosa*, was only screened at PC unit, Bangalore.
- Six different dates of sowing: The per cent deadheart caused by shoot fly was higher in July and August in particular during early stage of the crop. Late sowing harbours the shoot fly incidence.

Remarks

- Resistant lines identified in AICRP trials should be registered with NBPGR as novel genetic stock.
- We need to confirm the already susceptible and resistant checks for various insect-pests, all the breeding materials should be screened against the identified susceptible and resistant checks for all the insect-pests.

Dr. KB Palanna presented the research highlights of TSP and NEH programmes as below

- **Tribal Sub Plan:** Programme under Tribal sub plan resulted in introduction of finger millet in tribal populations for cultivation and also consumption. The tribal population in different small millets growing states is encouraged both in physical and financial terms by facilitating small millets cultivation and increasing production and consumption by providing them with improved varieties and also required inputs and implements.
- The TSP programme was carried out in five centres viz., Jagdalpur, Athiyandal, Dindori, Mandya and Vizianagaram. An amount of Rs. 5.00 lakhs was released to different centres during the year 2017-18. The total area covered was 51.6 ha with 109 beneficiaries.

- Popularization of small millets in NEH Region: A total of Rs. 40.48 lakhs has been allocated three centres, viz. Gossaigaon in Assam, Agartala in Tripura and Namthung, Sikkim to popularize the small millets in NEH region by way of conducting demonstration in farmer's fields in summer and kharif 2017 and summer 2018.
- The improvement in demonstrations of foxtail millet during Rabi2016-17 in Assam (Gossaigaon) was 107.83% and that of demonstrations of finger millet in Kharif 2017 was 74.50%. A total of 165 farmers are benefitted through demonstrations.
- Popularizing cultivation of finger Millet under rain fed condition of Tripura, 50.0 ha area has been identified and conducted front Line demonstrations in 8 districts and 3 KVKs across Tripura. Latest Varieties of Finger Millet (KMR-301 and KMR-204) were demonstrated in farmer's fields.

Remarks

- For TSP/FLD information regarding mobile number, Aadhar number should be recorded for all the beneficiaries.

Session -III: Review of Research: Scientific audit of AICRP centers

- Chairman** : Dr. Pankaj Kaushal, Joint Director (Research), ICAR-NIBSM, Raipur
- Co Chairman** : Dr.Prabhakar, Project Coordinator, AIRCP on Small Millets, PC Unit, Bengaluru
Dr.Dinesh Kumar, PS, ICAR, New Delhi
- Rapporteurs** : Dr. K.B.Palanna and Dr. N. Anuradha

Chairman welcomed the delegates and the officer In-charge of the centres were asked to present research highlights of all the disciplines of their centre during the year. Accordingly, presentations were made by the concerned Officer In-charge's of the centres within the stipulated time.

1. Mandya: Dr. Ravishankar, Principal Investigator (Plant Breeding), AICRP (Small Millets), VC Farm, Mandya presented the research highlights and achievements including FLDs and seed production activities of center as well as contribution of breeding material to AICRPSM centers.

- Ragi variety KMR 630 was released at state level. It is a white ragi variety with earliness (95-100 days), non-lodging and suitable for mechanical harvesting.
- 33550 germplasm of finger millet and 105 germplasms of foxtail millet were maintained at this center
- Developed technology for foot rot disease in finger millet.

Chairman suggested registering germplasms/ lines with multiple resistance to diseases with NBPGR as noble genetic stock with the supplementation of available data. The core germplasm developed can be evaluated over different locations for physiological/ molecular/ other traits for generating universal information on the germplasm lines.

2. Athiyandal: Dr. Nirmala Kumari, Principal Scientist (Plant Breeding & Genetics), Center of Excellence in millets, Athiyandal, Tamil Nadu presented the thrust areas, research highlights and achievements of experiments/trial including FLDs and seed production activities of centers and contribution and sharing of breeding material in AICRP testing.

- Forty thousand and fifty germplasms of small millets were maintained in center of which 24 were used in the breeding programme
- Finger millet productivity is highest in Tamil Nadu (3132 kg/ha).
- Barnyard millet area increased and kodo millet area decreased last year.
- One Proso millet variety TNAU-202 was released at national level in 2017.
- DBT project on waxy and non-waxy finger millet genotypes in collaboration with Assam for value added products was extended for one year.
- Identified few lines with high culm strength in little millet and kodo millet

It is advised to do back cross breeding after knowing the nature of gene action and identifying genes for waxy or non-waxy type. After, discussion on inconsistency of partial genetic male sterility system available in finger millet, it was suggested to check for CGMS if any.

3. Nandyal: Dr. Saralamma, S, Principal Scientist (Plant Pathology), Regional Agricultural Research Station, Nandyal, Andra Pradesh presented the research highlights of trials/FLDs and seed production activities in foxtail millet. .

- SiA 3222 derived from cross of SiA 3075 x SiA 326 is submitted for release to AP state in different cropping systems as preceding or inter crop or subsequent crop to maximize additional profit.
- Foxtail millet variety SiA 3088 was approved for release and notification in 79th CVRC meeting held at IARI, New Delhi on 20th January 2018.
- Downy mildew was observed for the foxtail millet crop sown in June and *Cercospora* leaf spot was observed in finger millet.

It is advised to confirm the cercospora leaf spot observed in finger millet with microscopic and other tests as suggested by Dr. AK Jain, Professor of Plant Pathology, Rewa. Project Coordinator pointed out that despite large amount of segregating materials of foxtail millet at Nandyal, the centre did not share any last year. This is not a healthy trend. It is a national activity and would benefit all the centres for which it is shared. Also, the contributing centre would get major benefit as its materials would be screened for adaptability in initial stage only. The materials are to be shared with MTA. The Breeder promised to share the materials from this year.

4. Vizianagaram: Dr. T.S.S.K Patro, Senior Scientist (Plant Pathology) & O/C, Agricultural Research Station, Gajularega, Vizianagaram, Andra Pradesh presented the research highlights, FLD results and seed production activities. .

- Submitted variety release proposal of new ragi variety VR 900 having yield potential of 30-40 q/ha and moderately resistant to blast, sheath blight and bacterial leaf blight and Variety VR 988, its medium duration with yield potential of 30-35 q/ha.
- Inter cropping ragi with red gram in 8:2 ratio given additional income to the farmers
- Vizianagaram is the hotspot for finger millet blast, 3000 lines were screened over three years and few resistant lines were identified and maintained.
- ICO 476586, ICO 476855 and ICO 587992 were used in crossing programme as donor for blast resistance and earliness
- NGOs and other small millet growing farmers were trained for value added products.

The Chairman advised to utilize the blast data generated in 3000 lines and to do association mapping studies in collaboration with other centres for blast and other economic traits. Publish the data of blast in 3000 lines and resistant lines can be registered with NBPGR and also submit success stories of the beneficiary farmers to Project Coordinator (SM) for documentation.

5. Jagdalpur: Dr. A.K. Thakur, Agronomist & O/C, Zonal Agricultural Research Station, Jagdalpur presented the research highlights, germplasm maintained in kodo millet, little millet and finger millet as well as contribution of breeding material in AICRP testing and nuclear and breeder seed produced in small millets.

- Finger millet variety BR-36 (Chattishgarh Ragi-2) notified for Chattisgarh state.
- And release proposal submitted to SVRC for release of little millet genotype BL-41-3.
- Finger millet + redgram and Finger millet + Dolichos bean were good in inter cropping studies.
- Indira ragi, a finger millet was released at state level.

The centre was advised to collect more germplasm as millet diversity is more in Bastar. Evaluate them and also deposit in NBPGR and PC Unit. The availability of the chemical, Isoproturon is to be checked prior to the recommendation of the same.

6. Waghai: Dr. Harsha Patil, Senior Breeder, Hill Millet Research Station, Waghai presented the research highlights, germplasm maintained in finger millet, little millet and barnyard millet as well as contribution of breeding material in AICRP testing and sharing of breeding material across the centers through PC unit.

- One variety, GNN-8 in finger millet and one variety, Guj. Kodra-3 in Kodo millet were released for cultivation last year.
- A finger millet variety, GN-5 was recommended for South Gujarat heavy rainfall zone (AES-I) during *kharif* and was advised to go for 75% RDF + vermicompost @ 2t/ha to get higher B: C ratio.
- A little millet variety, GV-2 was recommended for South Gujarat heavy rainfall zone (AES-I) during *kharif* and was advised to go for 60-40-0 NPK per ha to get higher B:C ratio.
- Seed treatment with *Pseudomonas fluorescence* (CFU 108/ml) and two sprays of *Pseudomonas fluorescence*@ 6ml/l first at initiation of disease and second 15 days after first spray is effective for blast management.

The centre was advised to collect more germplasm from PC Unit or IIMR instead of restricting to germplasm from Gujarat state only. Released varieties before 10 years of release were advised to register with PPV & FRA. The centre was appreciated for release of varieties till last year and having good team.

7. Ranichauri: Dr. Lakshmi Rawat, Jr. Pathologist & O/C, Uttarakhand University of Horticulture & Forestry, Ranichauri presented the research highlights, germplasm maintained in finger millet and barnyard millet as well as germplasm collected in finger millet, barnyard millet, proso millet and foxtail millet and Seed production activities of the center.

- Out of 166 accessions screened, 31 accessions were found resistant to *Cercospora* leaf spot and blast disease
- Biocontrol repository for stem borer and shoot fly in barnyard millet is maintained.
- Shoot fly and stem borer damage was observed in barnyard millet.
- Technology of using value added FYM (FYM pre colonized by *Pseudomonas fluorescences* + *Trichoderma viride* and *Bacillus subtilis*) have been recommended for Uttarakhand farmers for managing sheath blight and leaf spot disease in barnyard millet

The centre was advised to screen the germplasm collected from Uttarakhand state for resistance to diseases. A breeder and entomologist need to be posted for effective conducting of breeding and entomology trials respectively.

8. Berhampur: Dr. Mohapatra, Sr. Breeder, Regional Research Station, Berhampur presented the research highlights, germplasm maintained and collected in finger millet and little millet and contribution and sharing of breeding material across the centers and nuclear seed produced in finger millet.

- Proposal was submitted for notification of recently released finger millet variety KALUA (OEB 532) and little millet variety OLM 217 to SVRC
- 190 lines of finger millet germplasm were maintained.
- One project was submitted under RKVY to the Odisha government under millet mission.

August body suggested sharing breeding material with other centers and also it is advised that scientists are to be present at the time of monitoring team visit.

9. Ranchi: Dr. ZA Haider, Breeder and O/C, Birsa Agricultural University, Kanke-Ranchi, presented the research highlights as well as seed production and FLD activities of center

- 111 lines of finger millet germplasm were maintained.
- JWM-1, a white seeded ragi was sent for registration.
- In little millet, a variety which matures in two months is needed keeping in view of moisture constraint
- Highest grain yields were obtained with seed dressing of ragi with bio-fertilizers @ 3g/kg, followed by 100% RDF + micronutrients (Zn & B) along with FYM

The centre was advised to give the FLDs data as per the guidelines and proforma given by Ministry of Agriculture & Farmers Welfare, Government of India, which is mandatory to all centres. It is being monitored by the NFSM.

10. Rewa: Dr. AK Jain, Pathologist & O/C, AICRP on Small Millets, College of Agriculture, Rewa presented the research highlights, contribution and sharing of breeding material across the centers and nuclear seed produced.

- Resistant sources were identified for kodo millet and little millet.
- Higher grain yield was obtained in normal sowing but highest harvest index was observed for early sown crop.

The center was closed. However, it was advised to take up seed production in little millet and kodo millet at the centre and as well as at Dindori centre. Project Coordinator mentioned that it would continue as voluntary centre till March 2020 and also assured to provide some contingencies for seed production activities and other trials.

11. Dindori: Dr. S. K Chaubey, Entomologist, Tribal Agricultural Research Station, presented the research highlights, germplasm maintained in kodo millet and little millet and contribution of breeding material in testing across the centers and nuclear seed production in kodo millet and little millet

- One variety of little millet namely DLM-103 was sent to SVRC for rainfed areas of MP (Recommended for notification in 75th CVRC)
- A total of 1165.40kg breeder seed of kodo millet and little millet were produced
- RDF + organic fertilizers gave highest yield

It was advised to go for breeder seed production of JK-8 and other 3-4 varieties at the centre. It was appreciated for FLDs and TSP programme. Pathologist and breeder should be posted.

11. Kolhapur: Dr. Sunil R Karad, Associate Professor (Plant Breeding), National Agricultural Research Project, Submontane Zone, Kolhapur presented the research highlights, germplasm maintained in finger millet, Kodo millet and Foxtail millet and contribution of breeding material in testing across the centers.

- Finger millet variety KOPN 942 was proposed for release in the areas of Western Maharashtra. It's non lodging type with resistance to stem borer and comes to harvest 15 days earlier than Pulhe Nachini.
- Initiated mutation breeding in Pulhe Nachini.
- Seed was given free of cost to Nachani clubs, which raises the nursery and distribute the of seedlings to farmers for transplanting.

The centre was advised to take model of *rabi* sorghum improvement of MPKV, Rahuri in seed production as an example for finger millet. Breeding for little millet and promotion of foxtail millet is required. Little millet seed production is to be increased.

General suggestions/Remarks

- ✓ Assistant Director General (Crops), ICAR, New Delhi advised to establish artificial screening facilities 2-3 centers for screening and identification of disease resistant lines/germplasms of important diseases of small millets.
- ✓ Project Coordinator, AICRP on Small Millets, PC unit, GKVK, Bengaluru suggested to include most susceptible and resistant lines/germplasms while screening AVT/IVT entries of small millets across the centers for comparison and to identify most promising entries.
- ✓ Suggested to initiate work on identification of patho-types in finger millet blast pathogen.
- ✓ Each center should come out with discipline wise research achievements as recommendation.

- ✓ The identified line/culture resistant to particular disease after screening for three years of testing to be registered with NBPGR.
- ✓ Any new line/culture identified for any specific trait for three years can be registered with NBPGR which is equivalent to developing a variety.
- ✓ Each centre should contribute to the central pool of germplasm.
- ✓ A consortium of core collection to be evaluated for yield traits at majority centres, for biotic and abiotic stress at hotspots and also assess molecular biodiversity.
- ✓ Generation of more breeding material.
- ✓ More number of crosses to be attempted using more bio diverse material so as improve particular traits.
- ✓ More care should be given while selecting parents for crossing.
- ✓ Work on barnyard millet has to be initiated as there is no national variety.
- ✓ Own segregating generations can be used for developing molecular markers, if markers are not available.
- ✓ Identify molecular markers and use in marker assisted breeding.
- ✓ Map core collection for stress differentials.
- ✓ Research articles to be published in Journals with a minimum of 6 NAAS rating are advisable.

Finally, chairman congratulated all the speakers for their good presentation and release of varieties at state and national level. The session ended with vote of thanks to the chairman by Project Coordinator, ICAR-AICRP on small millets, PC Unit, GKVK, Bengaluru.

Session V: Proceedings of the Varietal Identification Committee meeting

Location: 29th Annual General Group Meeting of ICAR-AICRP on Small Millets at IGKV, Raipur

Date: 12th April, 2018

The varietal identification committee meeting for small millets was held on 12th April 2018 at 29th Annual General Group Meeting held at IGKV, Raipur. The following members were present

S No.	Particulars	Proposed name	Position
1.	Assistant Director General (FFC)	Dr. I.S. Solanki, ADG (FFC)	Chairman
2.	Director of Research of Host University	Dr.S.S. Rao, Director Research, IGKV, Raipur	Member
3-4	Two Eminent Scientist not associate with Proposed variety	Dr. O.P. Kashyap, Dean, COA, IGKV, Raipur	Members
		Dr. A.K. Sarawgi, Professor Plant Breeding, IGKV, Raipur	
5.	Representative from State seed corporation	Shri. R.S. Ratre	Member
6.	Representative from State seed Certification agency	Shri. S.C. Padam	Member
7.	Project Coordinator (Small Millets)	Dr. Prabhakar, PC Unit, GKVK, Bengaluru	Member Secretary
Principal Investigators			
1.	Plant Breeding	Dr. C.R. Ravishankar	
2.	Entomology	Dr. Prabhu C. Ganiger	

The committee examined four variety identification proposals of small millets consisting of finger millet, barnyard millet and proso millet. The VIC after considerable deliberations made the following recommendations.

Small Millets

S No.	Tested Number	Variety description	Centre/Company proposed	Regions proposed for identification	Recommendations of the committee
1.	VL Mandua 386	Finger millet	ICAR-VPKAS, Almora, Uttarakhand	North Zone	The variety was not found superior to the latest check for the North Zone and it did not show consistent performance over the testing years. The data on insect pest and quality parameters were not given. Hence, variety is not identified for release.
2.	VL	Barnyard	ICAR-VPKAS,	All India	The variety was not found to be

	Madira 249	Millet	Almora, Uttarakhand		superior to the check and also it was not agronomically superior. The variety was highly susceptible to banded sheath blight and grain smut. The data on insect pest and quality parameters were not given. Hence, variety is not identified for release.
3.	DHBM- 23-3	Barnyard Millet	ARS, Hanumanamatti, UAS, Dharwad, Karnataka	All India	The variety was found to be superior over the check in Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu. The variety is found to have excellent fodder yield and possesses higher zinc, iron and protein content than the checks. Hence, the variety is identified for release in Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu.
4.	DHPM 2164	Proso Millet	ARS, Hanumanamatti, UAS, Dharwad, Karnataka	All India	The variety was found to be superior to check and agronomically it was inferior to checks. It showed higher incidence of shoot fly. Hence, variety is not identified for release.

Sd/-

(S.S. Rao)
Director Research Services
IGKV, Raipur

Sd/-

(Prabhakar)
Project Coordinator (Small
Millets), Bengaluru

Sd/-

(I.S. Solanki)
Assistant Director General
(FFC), ICAR, New Delhi

Session VI: Presentation of lead topics

Chairman: Dr. Dinesh Kumar, Principal Scientist, ICAR, New Delhi
Co-Chairman: Dr. Prabhakar, Project coordinator, Small Millets, Bengaluru
Rapporteurs: Drs. .Anuradha and Raveendra,H.R

At the outset the Chairman welcomed the gathering and introduced with the speakers of the session. In total 4 presentations were made on different topics.

Dr. Hari Prasanna presented his lead topic on “**DUS characterization in small millets and importance in AICRP trials**” The major highlights of the special lecture are as follows.

- DUS testing will be done by the centres allotted but DUS characterization can be done by any one and it will be beneficial to characterize for elite lines.
- Protection of Plant varieties comes under the roof of Intellectual Property Rights
- Under UPOV, Plant Breeder Right was formed for the benefit of breeders.
- PBR has exclusive rights over the propagating material.
- India being a member of WTO, a *suigeneris* system of protection of plant varieties, PPV & FRA was formed in 2001. It is the only country which recognizes the farmer's rights in developing a variety.
- PPV & FRA helps in prevention of girt and provide privilege to breeder's rights, farmer's rights, community rights and gene fund.
- DUS test is a field test; at least the new variety should differ for one distinguishing character, uniform in expression and stability of expression of essential characters.
- DUS characterization during AVT helps in generating more robust data for SVRC or CVRC
- For small millets, PC Unit, Bangalore is the main centre (Nodal centre) and Athiyandal is the coordinating centre (Co-Nodal centre) for DUS testing.
- At present, in finger millet 26 traits, out of them 5 traits are for grouping the varieties. In foxtail millet, 10 essential traits, little millet , 20 traits out of which 8 are essential traits, In kodo millet 12 essential traits out of 30 traits, in barnyard millet, 10 essential traits out of 23 traits and in proso millet 20 traits were assigned for DUS testing in the guidelines of PPV & FRA.

Dr. Sushil Pandey presented his lead topic on “**Procedure for conservation of germplasm, released varieties and registered germplasm at ICAR-NBPGR**” The major highlights of the special lecture are as follows.

- Plant germplasm is a treasure and 58,532 millet germplasm including sorghum and pearl millet are in the gene bank of ICAR-NBPGR. Landraces are bigger contributors in the gene bank
- Landraces, farmers varieties, parental lines of hybrids, primitive cultivars, wild and weedy relatives are preserved in the gene bank
- The germplasm seed should be sent along with the passport data to NBPGR
- Regarding requirement of IC No. for variety release proposal, 2000 seed for self pollinated and 4000 seed for cross pollinated crops is required along with the details of the entry.
- Registration of Plant germplasm started from 1996. It is a type of protection. Data is displayed in the website; hence a breeder can look in to the details of germplasm and can indent NBPGR.
- For registration of germplasm a specific trait for which it differs from others is required. For quantitative traits, two years and two locations data (4 environments) and for qualitative traits, two environment data

is sufficient. For biotic and abiotic resistance, Biochemical studies four environment data along with supporting documents either in annual report/ AICRP report is required for registration.

Dr. M. Elangovan presented his lead topic on “**Status of millet genetic resources management**” The major highlights of the special lecture are as follows.

- In the global seed bank, 72,000 accessions are available, out of them 15,000 are originated from India.
- At Svalbard, Norway, the millet germplasm is stored at -18°C with electrical supply and in natural condition it will be stored at 4°C.
- At ICRISAT, 61,200 accessions of millets are preserved. In finger millet, 1400 accessions are from Indian origin.
- At NBPGR, 11,587 accessions are stored.
- AT IIMR, 2835 accessions and at GKVK, Bangalore, 10,183 accessions are maintained.
- In 2017-18, 5,148 accessions were raised in augmented design at IIMR
- In 2016-17, five explorations for collecting germplasm were undertaken by IIMR out of which three were with NBPGR regional stations. Maximum accessions were collected from Odisha and Tamil Nadu.
- In 2017-18, 181 millet accessions were collected from Javadhu hills of Tamil Nadu, 50 from Vizianagaram were collected by IIMR. While collecting these accessions **Digital field book** was utilized for the **first time in the country**.
- In finger millet, 5 accessions were observed to have long finger length and 3 accessions were observed to have wider fingers
- In kodo millet, 10 accessions were characterized.
- In foxtail millet, one accession had a split at the tip of the panicle appearing as if it has fingers, it can be called as fingofox, and this character is persistent till the end of the harvest.
- In proso millet, >20 tillers were recorded
- In finger millet, < 70 cm height, grain yield > 70 g/plant were observed.
- In Brown top millet, 29 accessions were collected.

Dr. Dr. A. K. Jain presented his lead topic on “**Disease Management in Small Millet Crops**”. The major highlights of the special lecture are as follows.

- Explained about disease scenario of all the six crops of small millets, diseases reported in India and their hot spots.
- Important diseases of Finger Millet and Small Millets and their management practices.
- Emphasized about emerging disease problems in Small Millets.
- Future strategies to overcome the problems of divested diseases.

Project Coordinator advised the breeders to attend the field day to be organized at IIMR, Hyderabad during this kharif. Meanwhile, they can give request to IIMR for any germplasm required for crop improvement programme. Dr. Dineshkumar, Chairman asked all the breeders were asked to register the trait specific genetic stocks at NBPGR, New Delhi without loss of time.

Finally Chairman thanked all the presenters who were presented their lead topics. The session ended with vote of thanks to the chair.

Session VIII: Plenary session

(Presentation of session-wise recommendation and technical programme of work)

- Chairman** : Dr. I S Solanki, ADG (F&FC), ICAR, New Delhi
Co-chairman : Dr. SS Rao, Director of Research Services, IGKV Raipur
: Dr. Prabhakar, PC, AICRP on Small Millets, GKVK, Bengaluru
- Rapporteur** :Dr. Krishna T V, PI. Breeder, AICRP on Small Millets, PC Unit, Bengaluru
Dr. L N Yogesh, Assistant Professor, ARS, Hagari, UAS Raichur

At the outset the chairman welcomed all the delegates and Scientists to the plenary session. He requested discipline-wise Principle Investigators to present the new technical programme of work for the year 2018-19 as finalized in the discipline-wise technical group meeting held on first day.

Firstly, Dr. C R Ravishankar, Principal Investigator of Plant Breeding presented the new technical programme framed for the 2018-19 and different suggestions discussed among Plant Breeders during group meeting. He mentioned the recommendations & suggestions made in the group meeting, then stressed upon the sharing of breeding material among the different centres and requested to participate in the National hybridization training programme to be organized in Kharif 2018 at Project Coordinating unit Bengaluru. He also mentioned that analysis of nutritional parameters has to be carried out by respective breeders for their entries. Rewa centre has accepted to produce Breeder seeds allotted to them with financial assistance required for seed production. Project Coordinator assured the fund required for seed production for Rewa centre as a voluntary centre. As there were no other specific issues, the technical programme of Plant Breeding for the year 2018-19 was accepted for implementation.

Dr. Sukanya TS, Principal Investigator of Agronomy presented the new technical programme of Agronomy, FLD and TSP programme chalked out for the year 2018-19. Project Coordinator mentioned that the approval for conduct of Frontline demonstrations is yet to be received from NFSM, Ministry of Agriculture & Farmers Welfare, New Delhi. As there were no other specific issues, the technical programme of Agronomy, FLDs and TSP for the year 2018-19 was accepted for implementation.

Dr. TSSK Patro, Principal Investigator of Plant Pathology resented detailed technical programme of Plant Pathology for year 2018-19. The Chairman asked Project Coordinator to identify a center for disease screening of advanced lines in green house condition for efficient evaluation. He also requested the group to go for pre-breeding and distribute the materials among the working group. With thorough discussion the technical programme of Plant Pathology for the year 2018-19 was accepted for implementation.

Dr. Prabhu Ganiger, Principal Investigator of Agriculture Entomology, has presented the new technical programme of Agriculture Entomology for the year 2018-19. The chairman suggested identifying resistant and susceptible checks in all the crops to facilitate better screening of lines. As there were no other specific issues, the technical programme of Agriculture Entomology for the year 2018-19 was accepted for implementation

Dr. Prabhakar, Project Coordinator (Small Millets) presented the proceedings and recommendations of the Varietal Identification Committee meeting held on 12th April 2018. He mentioned that the committee examined four variety identification proposals of small millets consisting of finger millet, barnyard millet and proso millet. Out of 4 proposals, one Barnyard millet variety DIBM-23-3, proposed by ARS, Hanumanamatti, UAS, Dharwad, Karnataka was found to be superior over the check in Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu. The variety is found to have excellent fodder yield and possesses higher zinc, iron and protein content than the checks. Hence, the

Barnyard millet variety DHBM-23-3 is identified for release in Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu.

Dr. Prabhakar, Project Coordinator (Small Millets) also announced results of Best centre awards. The centres were given Best AICRP centers award for the year 2017-18 based on better implementation of technical programme, contribution of the centre to the project, performance in research, compliance and timely submission of data. The following 4 centres were given awards.

Best centre awards

Voluntary centres: ARS, Hanamanamatti, UAS Dharwad, Karnataka and ICAR-VPKAS, Almora, Uttarkhand

Regular centres: HMRS, Waghai, NAU, Gujarat and ZARS, SCARS, Jagadapur, IGKV, Chattisgarh.

After the award of best performing centres, Dr. Prabhu Ganiger conducted the programme on felicitation of retiring AICRP Scientists during this year and recollected their invaluable contributions for the success of small millets research. Felicitations were given to Dr. Solanki IS, ADG (FFC), Dr. Prabhakar, Project Coordinator (Small Millets) and Dr. CR Ravishankar, Sr. Breeder, UAS, Mandya by all delegates and Scientists with shawl and mementos, as they are superannuating in this year. The house recollected their invaluable contributions in the crop research.

Dr. SS Rao, Director Research Services, IGKV, thanked the authorities for providing opportunity to host the 29th AGM on small millets 2018. He also extended warm wishes to all the scientists & delegates.

Chairman, Dr. IS Solanki, ADG (FFC), ICAR profusely thanked Host University for hosting the 29th AGM on small millets. He gave following suggestions for millets improvement;

- As different centres have good facility, they should use this to develop new technology
- Suggested to deploy MAS, allele mining and pre-breeding for developing new variations or hybrid/varieties
- Insisted to work on postharvest technology for better milling or processing the millets
- Emphasized to identifying of resistant sources for pests and diseases in millet crops
- Stressed to exchange the genetic material freely among the scientists for fasten the millet varietal developmental process

He then acknowledged all for the opportunity and felicitating him on his retirement.

Finally, Dr. Prabhakar, Project Coordinator (Small Millets) proposed vote of thanks to all for overall success of 29th AGM of AICRP on Small Millets at IGKV, Raipur. He thanked all scientists in the meeting for successful conduct of meeting and whole heartedly extended warm thanks to Host University for their untiring support in conducting the 29th AGM on Small millets at IGKV Raipur, Chattisgarh, the whole team of SGCARS, Jagdalpur, IGKV. Dr. Abhinav Sao, Breeder, IGKV, Raipur proposed vote of thanks on behalf of host University. The Annual Group meeting was declared as closed at 3.00 p.m.

Part B: Proceedings of discipline-wise technical group meetings and recommendations

Technical programme for the year 2018-19

1. Breeding

Chairman : Dr. A.K. Sarawgi, Professor & Head, Genetics & Plant Breeding, IGKV, Raipur
Co-chairman : Dr. Prabhakar, Project Co-ordinator (SM)
Convener : Dr. CR Ravishankar, PI, Plant Breeding
Rapporteur : Dr Sunil Karad, Plant Breeder, Kolhapur
Dr. Krishna TV, Plant Breeder, PC Unit Bangalore

Dr. Prabhakar, Project Coordinator (Small Millets) welcomed the Chairman and all delegates. He then briefed about AICRP programmes in crop improvement viz., planning, new technical programme, guidelines for promoting and retaining of the promising lines in the network programme.

The discipline-wise technical programmes were discussed and finalized in the session and the technical programme finalized under the chairmanship of Dr. Sarawgi, Professor & Head, Department of Genetics and Plant Breeding, IGKV, Raipur. Dr. CR Ravishankar, Principal Investigator (Plant Breeding) initiated discussion on the technical programme of Plant Breeding based on the draft technical programme prepared earlier. The promotion of entries from IVT to AVT-I and AVT-I to AVT-II was strictly based on the overall performance/merit of the test entries and the selection criteria as decided in the previous workshop, which is as below.

Criteria 1: Outstanding performance for yield/main produce of the economic importance (by a margin of 10%) over the best performing check without compromising on other important features.

Criteria 2: More than 5% increase in GY over elite check, fodder yield on par or more than the check and disease/pest incidence numerically less or on par with the elite check

Criteria 3: In case of early duration varieties, more than 5% increase in GY over the elite early duration check, fodder yield on par/more than the check, and disease/pest incidence numerically less or on par with the elite check

Criteria 4: GY numerically on par or more than the elite check and significantly superior for major pest and disease resistance or significantly superior for grain and fodder quality, Yield marginally lower than the best performing check but outstanding in one or more strategic features relevant to the crop such as extra earliness, specific industrial product property, nutritional superiority etc..

Criteria 5: Variety or Hybrid based on diverse cytoplasm with numerical superiority or on par with the check on all the traits of interest

Based on the above criteria, the entries were promoted from IVT to AVT-I and AVT-I to AVT-II in all the six crops as below.

I. Formulation of technical programme for Kharif 2018-19

1) Finger millet Initial Varietal Trial in South Zone

South Zone				North Zone			
S. No.	States	No. of centres	Centres	S. No.	States	No. of centres	Centres
1	Andhra Pradesh	4	Vizianagaram, Chintapalle, Perumallapalle, Peddapuram	1	Bihar	1	Dholi
2	Chattisgarh	1	Jagdapur	2	Jharkhand	1	Ranchi
3	Gujarat	2	Dahod, Waghai	3	Madhya Pradesh	2	Dindori, Rewa
4	Karnataka	3	Bangalore, Mandya, Hanumanamatti	4	Uttarakhand	4	Almora , Gaja Majhera Ranichauri
5	Maharashtra	2	Dapoli, Kolhapur, Berhampur	5	North east	2	Gossaigaon Agartala
6	Tamil nadu	1	Athiyandal				
7	Telangana	1	IIMR, Hyderabad				
8	Odisha	1	Berhampur				
	Total	15			Total	10	

New entries	Will be finalized and added after the receipt of seeds along with data
Checks	VL 376,GPU 45,GPU 67, PR 202

2. Finger millet Initial Varietal Trial in North Zone

New entries	Will be finalized and added after the receipt of seeds along with data
Checks	VL 352,GPU 45,GPU 67, PR 202

3. Advanced Varietal Trial in Finger millet – Early & Medium duration, long (AVT- I): South zone

South Zone				North Zone			
S. No.	States	No. of centres	Centres	S. No.	States	No. of centres	Centres
1	Andhra Pradesh	4	Vizianagaram, Chintapalle, Perumallapalle, Peddapuram	1	Bihar	1	Dholi
2	Chattisgarh	1	Jagdapur	2	Jharkhand	1	Ranchi
3	Gujarat	2	Dahod, Waghai	3	Madhya Pradesh	2	Dindori, Rewa
4	Karnataka	3	Bangalore, Mandya, Hanumanamatti	4	Uttarakhand	4	Almora , Gaja Majhera Ranichauri
5	Maharashtra	3	Dapoli, Kolhapur, Igatpuri	5	North east	2	Gossaigaon Agartala

6	Tamil nadu	1	Athiyandal				
7	Telangana	1	IIMR, Hyderabad				
8	Odisha		Berhampur				
	Total	15			Total	10	

Promoted	FMV1113, FMV1114, FMV1115, FMV1116, FMV1117, FMV1118, FMV1119, FMV1120, FMV1126, FMV1127, FMV1131.
Retained	FMV1103, FMV1104.
Checks	GPU 45, VL 352 , GPU 67, PR 202 (4)

4. Advanced Varietal Trial in Finger millet – Early & Medium duration, long (AVT- I): North zone

Promoted	FMV1116, FMV1119 (Fodder)
Retained	FMV1102, FMV1104, FMV1106.
Checks	GPU 45, VL 352 , GPU 67, VL 376 (4)

5. Foxtail millet Initial and Advanced Varietal Trial (FIAVT)

S. No.	State	No. of centers	Name of testing centers
1	Andhra Pradesh	3	Nandyal , Vizianagaram, Palem
2	Bihar	1	Dholi
3	Jharkhand	1	Ranchi
4	Karnataka	3	Bangalore, Hanumanamatti and Mandya
5	Madhya Pradesh	2	Rewa, Dindori
6	Tamil Nadu	1	Athiyandal
7	Telangana	1	IIMR, Hyderabad
8	Maharashtra	1	IIMR, Solapur
9	North east	2	Gossaigaon and Agartala
Total no. of centres		15	
New entries	Will be finalized and added after the receipt of seeds along with data		
Retained	FXV603, FXV 606, FXV 607		
Checks	SiA 326, DHFt-109-3 and SiA 3156 (2)		

6. Kodo millet Initial and Advanced Varietal Trial (KIAVT)

S. No.	State	No. of centers	Name of testing centers
1	Andhra Pradesh	1	Nandyal
2	Chattisgarh	1	Jagdalpur
3	Gujarat	1	Dahod
4	Jharkhand	1	Ranchi
5	Karnataka	1	Bangalore

6	Madhya Pradesh	2	Dindori and Rewa
7	Tamil Nadu	3	Athiyandal, Pudukottai and Aruppukottai
8	Telangana	1	IIMR, Hyderabad
Total no. of centers		11	

New entries	Will be finalized and added after the receipt of seeds along with data
Retained	KMV542, KMV543, KMV545, KMV546, KMV547
Checks	TNAU-86, RK-390-25, RBK 155 (3)

7. Little millet Initial and Advanced Varietal Trial (LIAVT)

Sl. No.	State	No of centers	Name of testing centers
1	Chattisgarh	1	Jagdalpur
2	Gujarat	1	Waghai
3	Jharkhand	1	Ranchi
4	Karnataka	3	Bangalore, Hagari, and Hanumanamatti
5	Odisha	1	Berhampur
6	Tamil Nadu	2	Athiyandal and Paiyur
7	Madhya Pradesh	2	Rewa and Dindori
8	Maharastra	2	Kolhapur , Igatpuri
9	Andhra Pradesh	2	Vizianagaram, Perumalapalli
10	Telangana	1	IIMR, Hyderabad
Total no. of centers		16	

New entries	Will be finalized and added after the receipt of seeds along with data
Retained	LMV512, LMV513, LMV514, LMV518, LMV 521, LMV523
Checks	JK 8, OLM 203 and BL 6 (3)

8. Barnyard millet Initial and Advanced Varietal Trial (BIAVT)

S. No.	State	No. of centers	Name of testing centers
1	Andhra Pradesh	2	Vizianagaram ,Palem
2	Karnataka	1	Bangalore
3	Madhya Pradesh	2	Dindori and Rewa
4	Tamil Nadu	3	Athiyandal, Chettinad and Madurai
5	Uttarakhand	3	Almora, Gaja and Ranichauri
6	Telangana	1	IIMR, Hyderabad
Total no. of centres		12	

New entries	Will be finalized and added after the receipt of seeds along with data
Retained	BMV582(Fodder), BMV584(Fodder), BMV586
Checks	DHBM 93-3, VL 207 (2)

9. Proso millet Initial and Advanced Varietal Trial (PIAVT)

S. No.	State	No. of centers	Name of testing centers
1	Andhra Pradesh	3	Guntur, Palem & Nandyal
2	Bihar	1	Dholi
3	Karnataka	3	Bangalore, Hagari and Hanumanamatti
4	Tamil Nadu	2	Athiyandal, Pudukottai
5	Telangana	1	IIMR, Hyderabad
Total no. of centres		10	

New entries	Will be finalized and added after the receipt of seeds along with data
Retained	PMV441, PMV442, PMV444
Checks	TNAU 164, GPUP 21, TNAU 151 (3)

10. Brown top millet Initial Varietal trial (BTIVT)

S. No.	State	No. of centers	Name of testing centers
1	Andhra Pradesh	2	Vizianagaram, Perumalapalle
2	Karnataka	2	Bangalore, Mandya
3	Maharashtra	1	Kolhapur
4	Tamil Nadu	1	Athiyandal
5	Telangana	1	IIMR, Hyderabad
Total no. of centres		7	

New entries	Will be finalized and added after the receipt of seeds along with data
Checks	(3) Local varieties (both open and branch type)

It has been finalized to adopt Brown top millet as 7th millet trial in coordinated breeding trials from this year.

The following issues are also discussed in the technical programme of Breeding and finalized.

II. Sharing of breeding materials

The breeding materials should be shared among centres in all small millet crops. Breeders are requested to contribute the segregating generation materials and send to PC Unit. A common set will be prepared and sent for evaluation across locations. Due credit will be given to breeders who share the materials and it would give an

opportunity for the evaluation of materials in initial stage and help in identification of desirable materials at various locations according to the objectives of the centre.

III. National hybridisation programme

In order to generate new breeding materials, all the centres need to take up hybridisation programme compulsorily. The training for hybridisation programme was conducted last year and it is planned to conduct the training this year also for the benefit of all the breeders. The parents that can be used in hybridisation programme for trait-wise should be prepared centre-wise. The breeders need to take up crossing programme as per the plan.

IV. Suggestions and recommendations.

The suggestions and recommendations made in the group meeting are as follows;

1. The germplasm should be sent to PC Unit with passport data and also efforts to be made for getting IC numbers. Materials and germplasm available are to be shared as per existing MTA.
2. Scientists are requested to propose new projects and collaborate with ICAR-IIMR for basic and strategic research.
3. Collaboration with BARC, Mumbai should be explored for mutation breeding
4. As the DUS guidelines are finalized for all the six small millet crops, the AVT-II entries in these crops are to be characterized as per DUS guidelines.
5. For analyzing nutritional parameters, scientists are requested to collaborate with concerned universities, ICAR-IIMR, Hyderabad and NIN, Hyderabad.
6. Project Coordinating Unit at Bengaluru is requested to organise the training programme on hybridisation techniques in small millets this year for the benefit of all the newly joined breeders.
7. As Rewa center is closed, Project Coordinator has suggested the Dhindori center to take care of Nucleus and Breeder seed production allotted to Rewa center.
8. The PC stressed upon the sharing of breeding materials among different centers and requested all the breeders and specifically those breeders who did not contribute last year.
9. Guidelines in breeder seed production must be strictly followed by each Breeder and they have to send BSP-II, BSP-III, BSP-IV and BSP-V information to PC, ADG and Seed Division, Ministry of Agriculture & Farmers Welfare as mentioned in the BSP-I (Allocation of Breeder seed of varieties by PC).

Deadline for submission of entries: 30th April 2018

Deadline for submission of data: 15th December 2018

Quantities of seeds to be submitted under various stages of trials are as follows:

IVT	:	3 kg	AVT I	:	5 kg
AVT II	:	5 kg for breeding and 2 kg for agronomy			

The germination percentage of the seeds should be a minimum of 90%. Failing in any of the above criteria the entry will be rejected and informed.

Finally the Dr. CR Ravishankar Thanked all the Plant Breeders for their contribution and fruitful discussion in framing the new technical programme for 2018-19.

V. Allocation for Nucleus and breeder seed of varieties for Kharif 2018

The allocation has been made based on consolidated indent received from Dept. of Agriculture & Cooperation, Ministry of Agriculture & Farmers Welfare, New Delhi. The BSP program was finalized during 29th Annual Group Meeting of AICRP on Small Millets held at IGKV, Raipur, Chhattisgarh on April 12-13, 2018. All the Breeders/ Nodal officers concerned with small millets seed production are requested to take necessary action to organize the seed production as per the allocation and make all the efforts to achieve the target. If your seed production fails in a particular season, then contingency plans are to be made to produce in next favorable season in the same production year.

The schedule of sending BSP proformae is as follows:

BSP II	: Immediately after planting
BSP III	: Immediately after inspection by monitoring team.
BSP IV	: Communication of final seed production figures (Last Date: 30th November)
BSP V	: Lifting Status against indent

The information in the above Proforma including contingency plan for production in case of crop failure should be sent to:

1. Deputy Commissioner (Seeds), Dept. of Agriculture & Cooperation, Ministry Of Agriculture & Farmers Welfare, Krishi Bhavan New Delhi 110001.
2. Assistant Director General (Seeds), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi 110001.
3. Project Coordinator (Small Millets), AICRP on Small Millets, ICAR, GKVK, Bengaluru-560065.
4. Dr. Vilas A Tonapi, Director, ICAR-Indian Institute of Millets Research, Hyderabad-500030.

BSP-I: Allocation of breeder's seed production (National varieties): State-wise

Year of Indent: 2019-20

Year of production: 2018-19

S. No.	Location/ Crop	Name and address of Breeder	Variety	Notification year	DAC Indent	Allocation (quintals)	Organization for whom seed is to be produced		Members of monitoring team
1.	Almora (Uttarakhand)						State	Quantity (q)	
A)	Finger millet	Dr. Dinesh Chandra Joshi Scientist (Breeding) ICAR-Vivekananda Parvathiya Krishi Anusandhan	VL 352	2013	1.75	2.50	Karnataka Odisha NSC Uttarakhand	0.05 1.00 0.20 0.50	1. Dr. B. M. Pandey Scientist (Agronomy) ICAR-V.P.K.A.S, Almora 2. Director, State Seed Certification Agency Basanth Vihar, Dehradun, Uttarkhand – 248 006 3. Managing Director Uttarakhand Seed & Tarai Development Corporation, Pant nagar, P.O. Haldi, Dist. Nainital, Uttarkhand
			VL 315	2006	0.25	0.50	Bihar	0.25	
			VL Mandua 347	2012	0.75	1.00	Uttarakhand Bihar	0.50 0.25	
B)	Barnyard millet	Sansthan (VPKAS), Almora -263 601 (Uttarakhand)	VL Madira 207	2008	1.00	1.25	Uttarakhand Bihar	0.50 0.50	
			Sub total			3.75	5.25		
2.	UAS, NSP Unit, Bengaluru								
	Finger millet	Dr. Ramanappa/ Special Officer (Seeds), National	GPU 28	1998	2.69	4.00	CG Jharkhand K1Ka	1.00 0.09 1.60	1. Geneticist, P.C. Unit (Small Millets), GKVK, Bangalore- 560065

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		Seed Project, GKVK, UAS, Bengaluru- 560 065	GPU 48	2009	0.55	1.00	Bihar Karnataka NSC	0.25 0.10 0.20	2. Director, Karnataka State Seeds & Organic Certification Agency, Bellary Road, Hebbal, Bangalore 560024, Karnataka. 3. Regional Manager, National Seeds Corporation, Hebbal, Bangalore 560024, Karnataka
			GPU 67	2010	6.78	10.00	Jharkhand Bihar Tamil Nadu NSC	0.08 4.50 2.00 0.20	
			ML 365	2009	5.10	8.00	Karnataka Bihar NSC Tamil Nadu	1.90 2.00 0.20 1.00	
			Indaf-9	1988	0.05	0.10	Karnataka	0.05	
			Sub Total		15.17	23.10		15.17	
3. Kolhapur									
	Finger millet	Dr. Sunil Karad Breeder, National Agril.Res. Project Submontane zone, MPKV, Shenda Park, ,Kolhapur- 416012	Phule Nachini	2013	0.03	0.10	Maharashtra	0.03	1.Managing Director, Maharashtra State Seed Corporation Ltd., Mahabeej Bhawan, Amaravathi road, PB No. 119, Akola- 444 004, Maharashtra 2. Director, Maharashtra State Seed Certification Agency Shastrinagar, Akola- 444 004 3. Regional Manager, National Seed Corporation Ltd., No. 681-690,Gultekdi, Market yard, Pune- 411 037
			Sub Total		0.03	0.10		0.03	
4. Mandya									
	Finger millet	Dr. C.R. Ravishankar Associate Director of Research , RRS, V.C. Farm, Mandya Karnataka 571 405	Divya (MR 6)	2004	0.95	3.00	Karnataka NSC	0.75 0.20	1. Director, Karnataka State Seeds & Organic Certification Agency, Bellary Road, Hebbal, Bangalore 560024, 2. Regional Manager, National Seeds Corporation Hebbal, Bangalore 560024, Karnataka. 3. Managing Director, KSSC Ltd. Hebbal, Bangalore- 560 024
			MR 1	1998	0.10	0.20	Karnataka	0.10	
			Indaf 7	1984	0.05	0.10	Karnataka	0.05	
			Sub Total		1.10	3.30		1.10	
5. Ranchi									
	Finger millet	Dr. Z.A. Haider Breeder BAU, Kanke- Ranchi-843006, Jharkhand	A 404	1993	0.11	0.20	Jharkhand	0.11	1.Managing Director, State Seeds Corp. Ltd., Ranchi 2. State Seed Certification Agency, Ranchi 3. Area Manager, NSC Ltd, Sukh deo Nagar, Rani, Road, Ranchi- 834 005.
			BM 2	1996	0.08	0.20	Jharkhand	0.08	
			Sub		0.19	0.40		0.19	

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			Total						
6. Dholi									
	Finger millet	Dr. S. K. Singh Breeder, Tirhut College of Agriculture, Dholi-843 121 Muzafarpur, Bihar	RAU 8	1989	0.25	0.50	Bihar	0.25	1. Managing Director, Bihar Rajya Beej Nigam Ltd. Mithapur Farm Campus, Mithapur, Patna 2. Director, State Seed Certification Agency, Mithapur Farm, Mithapur, Patna 3. Area Manager, NSC Ltd, Near Prabhat Talkies, Muzafarpur- 842 001
	Proso millet	-do-	BR-7	1984	1.00	1.00	Bihar	0.50	
			Sub Total		0.75	1.50		0.75	
7. Nandyal									
	Foxtail millet	Dr. CVCM Reddy Scientist (Breeding) AICRP on Small Millets RARS, Nandyal - 518 503(AP)	SiA 3085	2013	4.50	6.00	Andhra Pradesh Bihar	4.50	1. Managing Director, APSSDC, HACA Bhavan, Hyderabad – 500 004 2. Director, AP State Seed Certification Agency, 1-10-193,1st Floor, HACA Bhavan, Hyderabad-500 004 3. Regional Manager, NSC Ltd., 17-11, Tukaram gate Lalaguda, Secunderabad-500 017
			Sub Total		4.50	6.00		4.50	
8. Hanumanamatti									
	Foxtail millet	Dr. Nagappa Harijan Breeder, Agriculture Research Station, Hanumanamatti-581 135, Haveri Dist.	HMT 100-1	2009	0.02	0.10	Karnataka	0.02	1. Director, Karnataka State Seeds & Organic Certification Agency, Bellary Road, Hebbal, Bangalore 560024, Karnataka. 2. Managing Director Karnataka State Seed Corporation Ltd. Hebbal Bangalore- 560 024, 3. Area Manager, NSC Ltd, Devihosur village & post, Haveri- 581 110
			Sub Total		0.02	0.10		0.02	
9. Jagdalpur									
A)	Finger millet	Dr. Ashwanikumar Thakur, Agronomist, AICRP on Small millets, ZARS, Kumharwand Farm, Jagdalpur-494 005, Chattisgarh	Chattisgarh- 2	2015	0.50	1.00	Chattisgarh	0.50	1. Managing Director,Rajya Beej Evam, Krishi Vikas Nigam, Telibandha, Raipur- 492 001 2. Managing Director, Chattisgarh State Seed Certification Agency, Labhandi Farm, Raipur- 492 001 3. Area Manager, NSC Ltd., Telibandha, aipur- 492006
			Indira Ragi- 1 (BR 7)	2012	1.00	2.00	Chattisgarh	1.00	
B)	Kodo millet		Indira Kodo 1 (BK 1)	2012	4.00	6.00	MP Chattisgarh	2.00 2.00	
			Sub Total		5.50	9.00		5.50	

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10. Dindori									
Kodo millet	Breeder, AICRP on Small Millets, Tribal Research Station, JNKVV, Dindori, Madhya Pradesh	JK 155	2000	1.50	2.50	MP	1.50	1.Managing Director, Madhya Pradesh Seeds & Farms Development Corpn. Ltd., Mother Theresa Marg, Area hills, Bhopal – 462 016 2. Regional Manager, NSC Ltd., 48/49, Industrial Area, Govindapura, Bhopal- 462 023. 3. Madhya Pradesh State Seeds Certification Agency, Office Complex Gautam Nagar, Bhopal-462 023.	
		Jawahar Kodo 13 (JK 13)	2007	0.30	0.50	MP	0.30		
		JK 106	2009	0.50	1.00	MP	0.50		
		Jawahar Kodo 439	2005	0.45	1.00	MP	0.45		
		Jawahar kutki-36	2009	0.20	0.50	MP	0.20		
		JK-4	2016	0.20	0.50	MP	0.20		
		Sub Total		3.15	6.00		3.15		
Little millet	Breeder, AICRP on Small Millets, Tribal Research Station, JNKVV, Dindori, Madhya Pradesh	JK 155	2000	1.50	2.50	MP	1.50	1.Managing Director, Madhya Pradesh Seeds & Farms Development Corpn. Ltd., Mother Theresa Marg, Area hills, Bhopal – 462 016 2. Regional Manager, NSC Ltd., 48/49, Industrial Area, Govindapura, Bhopal- 462 023. 3. Madhya Pradesh State Seeds Certification Agency, Office Complex Gautam Nagar, Bhopal-462 023.	
		Jawahar Kodo 13 (JK 13)	2007	0.30	0.50	MP	0.30		
11. Ranichauri									
Barnyard millet	Breeder AICRP on Small millets, Uttarakhand University of Hort. & Forestry, Hill Campus Ranichauri- 249 199 Tehri, Garhwal, Uttarakhand	PRJ 1	2009	0.10	0.20	Uttarakhand	0.10	1. Dr. Brij Mohan Pandey, Sr. Scientist (Agronomy) V.P.K.A.S, Almora 2. Director, State Seed Certification Agency Basanth Vihar, Dehradun, Uttarkhand – 248 006 3. Managing Director Uttarakhand Seed & Tarai Development Corporation, Pant nagar, P.O. Haldi, Dist. Nainital, Uttarkhand	
		Sub Total		0.10	0.20		0.10		
Grand Total				34.26	54.95		34.26		

Breeder seed allocation for production in 2018-19: Variety-wise

S. No.	Name of Variety	Year of Notification	DAC Indent
Finger millet			
1	Chhattisgarh – 2	2015	0.50
2	VL Mandua 352	2013	1.75
3	Indira Ragi-1 (BR-7)	2012	1.00
4	VL Mandua 347 (VL 347)	2012	0.75
5	Indaf-7	1984	0.05
6	GPU 67	2010	6.78
7	ML-365	2009	5.10
8	RATHNA (GPU-48)	2009	0.55
9	Divya (MR-6)	2008	0.95
10	VL Mandua-315	2006	0.25
11	GPU-28	1998	2.69
12	MR-1	1998	0.10
13	BM 2	1996	0.08

14	A-404	1993	0.11
15	RAU-8	1989	0.25
16	Indaf-9	1988	0.05
17	Phule Nachni	2013	0.03
	Total		20.99
Kodo millet			
1.	Jawahar Kodo-155 (RBK-155)	2000	1.50
2.	Jawahar Kodo 13 (JK-13)	2007	0.30
3.	Jawahar Kodo - 439	2005	0.45
4	Jawahar Kodo -106	2009	0.50
5	Indira Kodo -1 (BK-1)	2012	4.00
	Total		6.75
Foxtail millet			
1.	HMT-100-1	2009	0.02
2.	SiA 3085	2013	4.50
	Total		4.52
Proso millet			
1.	BR-7	1984	0.50
	Total		0.50
Barnyard millet			
1.	VL Madira 207	2008	1.00
2.	PRJ-1	2009	0.10
	Total		1.10
Little millet			
1	JK 36	2009	0.20
2	JK 4	2016	0.20
	Total		0.40
	Grand Total		34.26

Allocation of Nucleus seed production during *Kharif 2018*: Centre-wise

S. No.	Centre	Crop	Name of Variety	Year of notification	Nucleus seed (kg)
1	Almora	Finger millet	VL 352	2013	1.00
			VL 315	2006	1.00
			VL 347	2012	1.00
			VL-348	2016	1.00
			VL-376	2016	1.00
			VL-379	2017	1.00
		Barnyard millet	VL Madira 207	2008	1.00
		Finger millet	PRM 2	2011	1.00
2	Ranichauri	Barnyard millet	PRJ 1	2009	1.00
		Finger millet	PRB-903	-	1.00
			PRM-1	2009	1.00
			PRM-2	2011	1.00
		Proso millet	PRC-1	2010	1.00
Foxtail millet	PRK-1	-	1.00		
3	PC Unit, Bengaluru	Finger millet	GPU 28	1998	1.00
			GPU 48	2009	1.00

			GPU 45	2001	1.00
			GPU 67	2010	1.00
			ML 365	2009	1.00
			GPU-26	2000	1.00
			GPU-66	2018	1.00
4	Mandya		MR 6	2008	1.00
			KMR 301	2012	1.00
			Indaf 7	1984	1.00
			KMR 204	2012	1.00
			KMR-340	2017	1.00
			MR-1	1998	1.00
			L-5	2002	1.00
			Indaf-5	1985	1.00
			Indaf-9	1988	1.00
5	Hanumanamatti	Foxtail millet	HMT 100-1	2009	1.00
			DHFt—109-3	2018	1.00
		Finger millet	DHFM-78-3	2018	1.00
		Proso millet	DHP-2769	2018	1.00
		Barnyard millet	DHBM-93-2	2018	1.00
		Little millet	DHLM-14-1	2017	1.00
			DHLM-36-3	2018	1.00
6	Kolhapur	Finger millet	Phule Nachini (KOPN-235)	2013	1.00
		Little millet	Phule Ekadashi (KOPN-83)	2016	1.00
			Phule Bharti-1		1.00
7	Dapoli	Finger millet	Dapoli-1	1994	1.00
			Dapoli-2 (SCN-6)	2017	1.00
8	Ranchi	Finger millet	A 404	1993	1.00
			BM 2	1996	1.00
			BM-3		1.00
			JWM-1		1.00
			Gundli		1.00
9	Dholi	Finger millet	RAU 8	1989	1.00
		Foxtail millet	RAU-2	2017	1.00
		Proso millet	BR-7	1984	1.00
10	Berhampur	Finger millet	Bhairabi (BM-9-1)	1999	1.00
			Suvra (OUAT-2)	1999	1.00
			Chilka (OEB-10)	2001	1.00
			OEB-526	2011	1.00
			OEB-532	2016	1.00
		Little millet	OLM-203		
			OLM-207		
11	Nandyal	Foxtail millet	SiA 3085	2011	1.00
			SiA 3088	2012	1.00
			SiA 3156	2012	1.00
12	Vizianagaram	Finger millet	VR-936	2012	1.00
			VR 847	2010	1.00
			VR 762	2007	1.00
13	Jagdalpur	Finger millet	Chattisgarh -2	2015	1.00

			(BR-36)		
			Indira Ragi -1 (BR 7)	2012	1.00
		Kodo millet	Indira Kodo 1 (BK 1)	2012	1.00
			Chhattisgarh Kodo-2	2014	1.00
		Little millet	BL-4	2016	1.00
			BL-6	2014	1.00
14	Dindori	Kodo millet	Jawahar Kodo 65	2009	1.00
			JK 155	2000	1.00
			Jawahar Kodo 13 (JK 13)	2007	1.00
			JK-98	2010	1.00
			JK-106	2009	1.00
			JK-439	2005	1.00
			RK-390-25	2012	1.00
			Jawahar Kodo-137	2016	1.00
			JK-48	2001	1.00
			DPS-9-1	2011	1.00
		Little millet	JK-137		1.00
			JK-8		1.00
			JK-36		1.00
			JK-4		1.00
15	Waghai	Finger millet	GNN-6	2016	1.00
			GN-5	2016	1.00
			GN-4	2006	1.00
			GNN-7	2017	1.00
		Little millet	GV-2	2016	1.00
			GNV-3	2018	1.00
		Kodo millet	GAK-3	2018	1.00
		16	Athiyandal	Finger millet	CO(Ra)14
CO 15	1996				1.00
Foxtail millet	CO (Te) 7			2005	1.00
Kodo millet	CO 3			2012	1.00
	TNAU 86			2005	1.00
Little millet	CO (Samai)4			2008	1.00
Barnyard millet	CO (KV) 2			2008	1.00
	MDU-1			2018	1.00
	Proso millet			CO (PV) 5	2007
TNAU 145				2007	1.00
TNAU 151				2008	1.00
TNAU 164				2009	1.00
TNAU 202				2017	1.00
TNPm230		2017	1.00		

The technical programme ended with vote of thanks to the Chairman.

Technical programme for the year 2018-19

2. Agronomy

Chairman	: Dr. N Pandey, Professor and head, Department of Agronomy, IGKV, Raipur
Co-chairman	: Dr. B. Boriah, Associate Professor of Agronomy and Ex PI (AICRP-SM), GKVK, Bengaluru
Convener	: Dr. Sukanya T.S., Agronomist, PC unit, GKVK, Bengaluru
Rapporteurs	: Smt. Shubhashree K.S., AICRP on SM, Mandya and Dr. Ajaykumar, AICRP on SM, Ranichauri

The concurrent session on group-wise meeting of Agronomy discipline began with the welcome of the Chairman, Co-chairman and other scientists from different AICRP centers by Dr. Sukanya T. S., PI Agronomy.

Following Agronomists were present:

1. Dr. U. S. Urkurkar, Professor of Agronomy, IGKV Raipur
2. M. Jyostna kiranamai, Scientist, RARS, Nandyal
3. Dr. K. Sivagamy, Junior Agronomist, Athiyandal
4. Mrs. Rajnikiranlakra, Junior Agronomist, Ranchi
5. Dr. A. L. Narayanan, Professor, Karaikal
6. Dr. Panigrahi, Sr.Scientist, Berhampur
7. Dr. Ashwani Kumar Thakur, Agronomist, IGKV, Raipur
8. Dr. R. D.Nigade , Jr. Agronomist, Kolhapur
9. Dr. Birjeshkumar Kuntikal Patel, Jr. Agronomist, Waghai

Before start of the technical session, Dr. Prabhakar, Project Coordinator (Small Millets) again welcomed Chairman, Co-chairman and Agronomists of different AICRP centers. He gave an oversight of the Coordinated Agronomy programme being carried out in the last 2 years. He mentioned that the Agronomy technical programme was given a new shape and direction with introduction of 7 thematic areas and was completely recast last year with the help of Dr. B. Boriah, the then PI (Agronomy). He requested the Agronomy group to have broadly two types of trials, viz. Multi-location trials and Location specific trials, in 7 thematic areas. Multi-location trials would be conducted in 2 to 6 locations depending on the thematic area and all the centres should be conducting 3 to 5 multi-location trials. Location specific trials would be considered based on the merit and should be restricted to few locations. He advised the Agronomists to conduct a total of 4 to 6 trials per centre only including multi-location and location specific trials. Further, he guided the scientists for formulation of an effective technical programme in the discipline of crop production so that very pertinent recommendations can be made for benefit of farmers. He advised the scientists to strictly adhere to the simplest and updated data format formulated and circulated from the PC unit while sending the data. He explained the nutritional importance of brown top millet, another additional climate resilient crop in the group of six small millets, which has made it a compulsion to be included for developing package of practices with special reference to fertilizer requirement and crop geometry.

In his opening address Chairman Dr. Pandey stressed upon the importance of Small millets and need for enhancing the productivity of small millets and the present need for mechanization. He also advised all agronomists for timely sending report in proper format for compilation of data. The Co chairman emphasized that the nutrient management research should focus more on organic source. For effective weed management, studies to identify an alternate herbicide for Isoproturon were discussed in millet crops. Each agronomist has actively participated in finalization of agronomy technical programme for 2018-19.

Recommendations made:

1. Finger millet based intercropping System (Finger millet + Amaranthus 90:10) was the most profitable system.
2. Seed rate of 15 kg/ha along with one intercultural operation at 20 DAS and one hand weeding at 40 DAS resulted higher grain yield of Barnyard Millet under Rainfed condition.
3. Barnyard millet based intercropping System (Barnyard millet + Amaranthus 4:1) was the most promising intercropping System.
4. Finger millet + Guar (8: 2) and Finger millet + Bhendi (8:2) intercropping systems were found to be profitable.
5. Two intercultivation along with one hand weeding gave highest grain yield followed by Pre-emergence application of Isoproturon @0.5 kg a.i./ha along with one intercultivation was found to be the best weed management practice under rainfed condition.
6. Application of Bensulfuron methyl + Pretilachlor @0.198 kg/ha as pre emergent herbicide found to be effective herbicide for weed management under irrigated conditions.

Technical programme of Agronomy for 2018-19

A. Multi-location trials

2.1 Evaluation of pre- released genotypes to fertility levels

Finger Millet

2.1.1: Response of pre released finger millet varieties to different levels of fertilizer under rainfed condition.

Treatments:

Finger millet (South Zone)	
Main plot: Fertility levels (F) : 3	Sub plot: Varieties (V): 5
F ₁ : 75 % RDF	V ₁ : FMV 1103
F ₂ : 100% RDF	V ₂ : FMV 1104
F ₃ : 125 % RDF	V ₃ : GPU 45*
	V ₄ : GPU 67*
	V ₅ : PR 202*

*National check, RDF: 50:40:25 kg NP₂O₅K₂O /ha

Finger millet (North Zone)	
Main plot: Fertility levels (F) : 3	Sub plot: Varieties (V): 5
F ₁ : 75 % RDF	V ₁ : FMV 1104
F ₂ : 100% RDF	V ₂ : FMV 1102
F ₃ : 125 % RDF	V ₃ : FMV 1106
	V ₄ : VL 352*
	V ₅ : VL 376*

*National check, RDF: 50:40:25 kg NP₂O₅K₂O /ha

Note: The above mentioned varieties should invariably be included in the trial. Seeds for the same will be arranged from the Project Coordinating Unit (Small Millets), Bengaluru.

Treatment combinations: 15

Main plot – Fertility Levels- F (3),

Sub plot: varieties –V (5)

Design : Split plot,
 Replications : Three (3)
 Plot size : Gross: 3.0 m x 4.5 m; net: 2.4 m x 4.2 m
 Crop/variety : Finger millet varieties as per treatment
 Spacing : 30 cm x 7.5 cm
 Fertilizer : Rainfed : RDF- 50:40:25
 As per treatment (N in two equal splits).

Location:

South Zone: Berhampur, Peddapuram, Waghai, Vizianagaram

North Zone: Almora, Ranchi, Ranichauri

Foxtail Millet

2.1.2: Response of pre-released foxtail millet varieties to different levels of fertilizer under rainfed condition.

Treatments:

Foxtail millet	
Main plot: Fertility levels (F) : 3	Sub plot: Varieties (V): 4
F ₁ : 75 % RDF	V ₁ : FXV 603
F ₂ : 100% RDF	V ₂ : SiA 326*
F ₃ : 125 % RDF	V ₃ : DHFT 109-3*
	V ₄ : SiA 3156*

*National check, RDF: 40:20:0 kg NP₂O₅K₂O /ha

Treatment combinations: 12

Main plot – Fertility Levels- F (3),

Sub plot: varieties –V (4)

Design : split plot
 Replications : Three (3)
 Plot size : Gross: 3.0 m x 4.5 m; net: 2.5 m x 4.10 m
 Spacing : 25 cm x 10 cm
 Crop/variety : as per treatment
 Fertilizer : RDF: 40:20:0 kg NP₂O₅K₂O /ha as per treatment
 Locations : Athiyandal, Nandyal, Hagari

Proso Millet

2.1.3: Response of pre-released proso millet varieties to different levels of Fertilizer under rainfed conditions

Treatments:

Proso millet	
Main plot: Fertility levels (F) : 3	Sub plot: Varieties (V): 4
F ₁ : 75 % RDF	V ₁ : PMV 441
F ₂ : 100% RDF	V ₂ : PMV 442
F ₃ : 125 % RDF	V ₃ : TNAU 164*
	V ₄ : TNAU 202*

*National check, RDF: 40:20:0 kg NP₂O₅K₂O /ha

Treatment combinations: 12

Plot size : Gross : 3.0 m x 4.5 m; Net: plot: 2.5 m x 4.1 m
 Spacing : 25 cm x 10 cm
 Crop/variety : Barnyard millet varieties as per treatment
 Fertilizer : RDF: 40:20:0 kg NP₂O₅K₂O /ha
 Locations : Almora, Ranichauri, Mandya

Kodo Millet

2.1.6: Response of pre-released Kodo millet varieties to different levels of fertilizer under rainfed conditions.

Treatments

Kodo millet	
Main plot: Fertility levels (F) : 3	Sub plot: Varieties (V): 4
F ₁ : 75 % RDF	V ₁ : KMV 542
F ₂ : 100% RDF	V ₂ : KMV 543
F ₃ : 125 % RDF	V ₃ : TNAU-86*
	V ₄ : RK-390-25*

*National check, RDF: 40:20:0 kg NP₂O₅K₂O /ha

Treatment combinations: 12

Main plot – Fertility Levels- F (3),

Sub plot: varieties –V (4)

Design : Split plot
 Replications : Three (3)
 Plot size : Gross : 3.0 m x 4.5 m; Net: plot: 2.5 m x 4.1 m
 Spacing : 25 cm x 10 cm
 Crop/variety : Kodo millet varieties as per treatment
 Fertilizer : RDF: 40:20:0 kg NP₂O₅K₂O /ha
 Locations : Dindori, Jagadapur, Waghai

2.2: Nutrient management in small millets

2.2.1. Effect of fertilizer levels and spacing on performance of brown top millet

Main plot: Fertility levels (F): 3

Sub plot: Spacing (S): 4

F₁: 75 % RDF

S₁: 22.5 cm X 10 cm

F₂: 100% RDF

S₂: 30 cm X 10 cm

F₃:125 % RDF

S₃: 45 cm X 10 cm

S₄: 60 cm x 10 cm

Design : FRCBD
 Replications : 3
 Plot size : Gross: 5.4 m x 4.2 m
 Fertilizer : NP₂O₅K₂O as per treatments
 RDF : 40:20:0 kg NP₂O₅K₂O /ha
 Location : Bengaluru, Jagadapur, Kolhapur, Vizianagaram

2.3: Assessing the performance of small millets to different sowing windows

2.3.1: Effect of different sowing windows for mitigating the climate change

Main plot: Millet crops (C) - Foxtail millet/Kodo millet/Little millet/Barnyard millet/ Proso millet

Sub plot: Sowing dates (S) -S₁: July 1st FN S₂: July 2nd FN S₃: Aug 1st FN S₄: Aug 2nd FN

S₅: Sep 1st FN S₆: Sep 2nd FN

Design: Split Replication: 3 Plot size: 3 m x 4.5 m Spacing: 30 cm x 7.5 cm

Centres: All centres with respective crops

C₁: Foxtail millet, C₂: Little millet, C₃: Proso millet : Bengaluru, Nandyal, Karaikal

C₁: Kodo millet, C₂: Little millet, C₃: Barnyard millet : Dindori, Athiyandal, Jagadapur

2.4: Weed management for small millets

2.4.1: Chemical weed control studies in finger millet

Treatments: 11

T₁: Oxadiargyl 80 WP at 150 g a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₂: Oxadiargyl 80 WP at 200 g a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₃: Bensulfuron ethyl 0.6 G + pretilachlor 6.0 G @ 0.165 kg a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₄: Bensulfuron ethyl 0.6 G + pretilachlor 6.0 G @ 0.33 kg a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₅: Butachlor 50 EC 750 g a.i./ha (within 3 DAS) + one intercultivation at 25- 30 DAS

T₆: Bispyribac sodium 10 SC 10 g a.i./ha (15-20 DAS) + one intercultivation 35- 40 DAS

T₇: Bispyribac sodium 10 SC 15 g a.i./ha (15-20 DAS) + one intercultivation 35-40 DAS

T₈: Ethoxysulfuron 15 WG 12 g a.i./ha (15-20 DAS) + one intercultivation 35- 40 DAS

T₉: Ethoxysulfuron 15 WG 15 g a.i./ha (15-20 DAS) + one intercultivation 35- 40 DAS

T₁₀: Two intercultivation with hand weeding at 20 and 40 DAS

T₁₁: Un weeded check

Design : RCBD

Replications : Three (3)

Plot size : Gross: 3.0 m x 4.5 m; net: 2.4 m x 4.2 m

Crop/variety : Finger millet varieties as per treatment

Locations : Ranchi, Kolhapur, Nandyal, Ranichauri

2.4.2: Chemical weed control studies in Kodo millet

Treatments: 11

T₁: Oxadiargyl 80 WP at 150 g a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₂: Oxadiargyl 80 WP at 200 g a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₃: Bensulfuron ethyl 0.6 G + pretilachlor 6.0 G @ 0.165 kg a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₄: Bensulfuron ethyl 0.6 G + pretilachlor 6.0 G @ 0.33 kg a.i./ha (within 3 DAS) + one intercultivation at 25-30 DAS

T₅: Butachlor 50 EC 750 g a.i./ha (within 3 DAS) + one intercultivation at 25- 30 DAS

T₆: Bispyribac sodium 10 SC 10 g a.i./ha (15-20 DAS) + one intercultivation 35- 40 DAS

T₇: Bispyribac sodium 10 SC 15 g a.i./ha (15-20 DAS) + one intercultivation 35-40 DAS

T₈: Ethoxysulfuron 15 WG 12 g a.i./ha (15-20 DAS) + one intercultivation 35- 40 DAS

T₉: Ethoxysulfuron 15 WG 15 g a.i./ha (15-20 DAS) + one intercultivation 35- 40 DAS

T₁₀: Two intercultivation with hand weeding at 20 and 40 DAS

T₁₁: Un weeded check

Design : RCBD
Replications : Three (3)
Plot size : Gross: 3.0 m x 4.5 m; net: 2.4 m x 4.2 m
Crop/variety : Kodo millet varieties as per treatment
Locations : Bengaluru, Dindori, Athiyandal

2.5 Conservation agriculture in small millets:

No experiment has been formulated under this thematic area during this year.

2.6 Millet based cropping systems for sustainable productivity

2.6.1: Enhancing the millet - system productivity with inter crops

Treatments:

T1: 1st Base crop +Intercrop (4:1)

T2: 1st Base crop +Intercrop (6:1)

T3: 1st Base crop +Intercrop (8:1)

T4: 2nd Base crop +Intercrop (4:1)

T5: 2nd Base crop +Intercrop (6:1)

T6: 2nd Base crop +Intercrop (8:1)

T7: Sole crop of 1st Base crop

T8: Sole crop of 2nd Base crop

T9: Sole crop of intercrop

Design: RCBD Replication: 3 Plot size: 4m x 5m RDF to Base crop

Centres: **All centers in respective crops**

Foxtail millet (1st), Proso millet(2nd) : **Athiyandal, Ranchi, Mandya**

Foxtail millet (1st), Little mille (2nd) : **Nandyal, Kolhapur, Ranichauri**

Kodo millet (1st), Barnyard millet (2nd) : **Dindori, Jagdalpur, Karaikal**

Inter crop: Red gram

2.7 Mechanization in small millets

2.7.1: Development of low cost technologies through mechanization in Finger millet

Method of sowing: S

S1) Sowing with animal drawn seed drill S2) Mechanized sowing

Method of weeding: W

W1) Hand weeding W2) Cycle weeding

Method of harvesting and threshing: H

H1) Farmers method

H2) Mechanical harvesting (reaper/combiner)

Treatments: 8

T1: S1+ W1+H1

T2: S1+ W1+H2

T3: S1+ W2+H1

T4: S1+W2+H2

T5: S2+ W1+H1

T6: S2+ W1+H2

T7: S2+ W2+H1

T8: S2+W2+H2

Plot size: 6 m x 20m (120 m²)

Centres: Mandya, Athiyandal, Bengaluru

B. Location specific trials

2.8.1: Effect of moisture regimes on growth and yield of transplanted finger millet under irrigated conditions

Treatments: 12

Main plots: Irrigation levels: (I) - 3

I₁: Irrigation 0.6 IW/CPE

I₂: Irrigation 0.8 IW/CPE

I₃: Irrigation 1.0 IW/CPE

Sub plots: Nutrient Management: N- 4

N₁: Soil Test base

N₂: 100% RDF

N₃: 150% RDF

N₄: Vermi compost to supply recommended dose of nitrogen only and balance of P and K through rock phosphate and Wood ash.

Note: The above treatments shall be imposed after establishing the crop during summer

Design : spilt plot
Replications : Three (3)
Plot size : Gross: 4.5 m x 5.4 m
Crop/variety : Finger millet variety Indaf 5 or HR 911
Spacing : 22.5 cm x 10 cm
Fertilizers : As per recommendation
Location : Mandya

2.8.2: Studies on evaluation of System of Ragi Intensification (SRGI)

Treatments:

1. Planting young seedlings (12/15/18 DOS)
2. Planting single seedling and double seedling
3. Square planting (22.5 cm x 22.5 cm, 25 cm x 25 cm and 30 cm x 30 cm)

Design : FRBD

Replications : Three (3)
Plot size : Gross: 3.0 m x 4.5 m; Net: 2.4 m x 4.2 m
Crop/variety : Finger millet varieties as per treatment
RDF : 50:40:25 kg NPK /ha

Observations to be recorded: Soil nutrients composition: Before and after experiment, growth, yield and yield components, economics (NMR and B: C ratio) and partial budgeting and per day productivity

Location: Karaikal

2.8.3: Sustainable intercrop association of Niger in Little millet

Treatments:

T₁: Sole little millet

T₂: Sole niger

T₃: Little millet + niger 2:1

T₄: Little millet + niger 4:1

T₅: Little millet + niger 6:1

T₆: Little millet + niger 2:2

T₇: Little millet + niger 4:2

T₈: Little millet + niger 6:2

T₉: Farmers practice (In little millet, niger seed is mixed and broadcasted in the field)

Design : RCBD
Replications : Three (3)
Plot size : Gross: 3.0 m x 4.5 m; Net: 2.4 m x 4.2 m
Variety : Little millet – Phule Ekadashi and Niger – Phule karala
Spacing : 30 x 10 cm RDF- 50:40 kg NP /ha

Observations to be recorded: Soil nutrients composition: Before and after experiment, growth, yield and yield components, economics (NMR and B: C ratio) and partial budgeting and per day productivity.

Location: Kolhapur

2.8.4: Performance of small millets during winter and summer season

Treatment details:

Small millets(C):C₁: Foxtail millet, C₂: Kodo millet, C₃: Little millet, C₄: Barnyard millet, C₅: Proso millet,
C₆: Browntop millet

Design : RCBD
Replication : 4
Plot size : Gross: 4.2 m x 3.6 m Net: 3 m x 3 m
Spacing : 30 cm x 10 cm
Location : Bengaluru

Summary of Agronomy trials for 2018-19

Trials		Centres
A. Multi-location trials		
2.1 Evaluation of pre- released genotypes to fertility levels		
2.1.1	FM (North zone)	Almora, Ranchi, Ranichauri
	FM (South zone)	Berhampur, Peddapuram, Waghai, Vizianagaram
2.1.2	FXM	Athiyandal, Nandyal, Hagari
2.1.3	PM	Almora, Hagari, Mandya
2.1.4	LM	Dindori, Kolhapur, Waghai
2.1.5	BM	Almora, Ranichauri, Mandya
2.1.6	KM	Dindori, Jagadapur, Waghai
2.2: Nutrient management in small millets		
2.2.1	BTM	Bengaluru, Jagadapur, Kolhapur, Vizianagaram
2.3: Assessing the performance of small millets to different sowing windows		
2.3.1	(FXM), (LM), (PM)	Bengaluru, Nandyal, Karaikal
	(KM), (LM), (BM)	Dindori, Athiyandal, Jagadapur
2.4: Weed management for small millets		
2.4.1	FM	Ranchi, Kolhapur, Nandyal, Ranichauri
2.4.2	KM	Bengaluru, Dindori, Athiyandal
2.5 Conservation agriculture in small millets		
No experiment has been formulated under this thematic area during this year		
2.6 Millet based cropping systems for sustainable productivity		
2.6.1	(FXM), (PM)	Athiyandal, Ranchi, Mandya
	(FXM), (LM)	Nandyal, Kolhapur, Ranichauri
	(KM), (BM)	Dindori, Jagadapur, Karaikal
2.7 Mechanization in small millets		
2.7.1	FM	Mandya, Athiyandal, Bengaluru
B. Location specific trials		
2.8.1	FM	Mandya
2.8.2	FM	Karaikal
2.8.3	LM + inter crop	Kolhapur
2.8.4	Small millets	Bengaluru

Note: FM: Finger millet, FXM: Foxtail Millet, PM: Proso Millet, LM: Little Millet, BM: Barnyard Millet

KM: Kodo Millet, BTM: Brown Top Millet

Technical programme for the year 2018-19

3. Plant Pathology

Chairman : Dr. A.S. Kotasthane, Professor & Head, Dept.of Plant Pathology, IGKV, Raipur

Convener : Dr. T.S.S.K.Patro, Pathologist &PI, ARS, Vizianagaram,ANGRAU

Venue : Conference Hall, Plant Pathology Division, IGKV, Raipur

The Plant pathology discipline meeting began with welcome of the Chairman and other scientists from different AICRP centres by Dr. T.S.S.K.Patro, Principal Investigator (Plant Pathology).

The following Pathologists were present in the discussions:

1. Dr. M. Rajesh, Athiyandal
2. Dr. S C Yadav, Jagdalpur
3. Dr. H.R. Raveendra, Mandya
4. Dr. S. Saralamma, Nandyal
5. Dr. Mrs. SavitaEkka, Ranchi
6. Dr. Mrs. LaxmiRawat, Ranichauri
7. Dr. A. K. Jain, Rewa
8. Dr. T.S.S.K.Patro, Vizianagaram
9. Dr. K.B.Palanna, PC Unit, Bengaluru.

The Principal Investigator introduced all the pathologists and made brief presentation on the type of trials as well as the progress made during 2017. The chairman requested all the pathologists to brief the results and the programme they planned for the ensuing season. After briefing by the pathologists the chairman made the following recommendations:

Technology recommendations:

Management of banded blight disease in all six small millets across the locations:

The soil application of value added *Pseudomonas fluorescens* + *Trichoderma asperellum* + *Bacillus subtilis* @1 kg each talc formulation mixed in 25 kg FYM or Vermicompost incubated for 15 days not only minimized (32.4 to 92.5%) banded blight, but also enhanced grain (30.7 to 127.5%) in all the six small millets across locations with Incremental Cost Benefit Ratio (ICBR) of 8.3 to 26.3%.

1. Dr.I.S.Solanki, Assistant Director General(Crop Science) has suggested to develop artificial inoculation facilities at selected locations to identify actual resistant lines.
2. Dr.Prabhakar, Project Coordinator(Small millets) has instructed to use resistant and susceptible checks invariably in all the screening trials.
3. Pathotypes of blast pathogen has to be established by collecting independent set of host. Action: PC Unit, Bengaluru

4. Correlation studies, mode of perpetuation and alternate weed hosts for rust of foxtail millet should be initiated during *rabi* (Action: Dr.S. Saralamma)
5. The title of the experiments in case of Donar Screening nursery has to be renamed as National screening nursery.
6. Resistant lines obtained after thorough screening has to be registered immediately with NBPGR, New Delhi.
7. All the centres invariably has to submit resistant lines obtained from germplasm and station material (other than released varieties and IVT,AVT material) for constituting entries for National screening nursery at the earliest.

Action:

Finger millet: Mandya, Atyandal, Jagadapur, Ranichouri, Vizianagaram

Foxtail millet: Nandyal, Atyandal, Rewa/ Dindori

Little millet: Atyandal, Dindori/Rewa, Jagadapur, Berhempur

Barnyard millet: Almorah, Ranichouri

Proso millet: Atyandal

Kodo millet: Rewa/Dindori, Jagadapur

8. The centres have been identified for supply of both resistant and susceptible lines for including both the checks in all screening trials.

Action:

Finger millet: Blast: GE4441(Resistant) ; *Uduru mallige*(Susceptible) - Mandya

Foxtail millet: Blast and Downy mildew: SiA-3282(Resistant line); SiA-3367(Susceptible line) -Nandyal

Little millet: Banded blight: RLM-208(Resistant line); DLM-95(Susceptible line) (Rewa)

Grain smut: DLM-95(Resistant line); RLM-223 (Susceptible line) (Rewa)

Barnyard millet: Both to Grain Smut and Banded blight :PRB-903 (Resistant line) and Local Dargi Ranichouri (LDR)-1(Susceptible line) (Ranichouri)

Proso millet: TN Pm-230 (Resistant line); Nilavoor local (Susceptible line) (Atyandal)

Kodo millet: Banded Blight : RPS 745 -Resistant line; DPS12- Susceptible line (Rewa)

Head Smut: DRS 118- Resistant line; RPS-727 Susceptible line (Rewa)

The following scientists will take lead in constituting the donor screening nursery by going through the previous annual reports and select around 10 to 15 lines in different crops mentioned against their names and make necessary arrangements for in-time supply of seeds to PC unit.

Dr. Laxmi Rawat : Barnyard millet;

Dr. S. Saralamma : Foxtail millet

Dr. M. Rajesh : Proso millet;

Dr. A.K Jain : Kodo millet and Little millet

Dr. H.R.Ravindra : Finger millet

After a brief appraisal by Dr. T.S.S.K.Patro, PI (Plant Pathology) on the ongoing experiments, the technical programme was thoroughly discussed and finalized.

New experiments formulated:

1. Management of Finger millet blast

Treatments:

1. Seed treatment with Carbendazim @2g/kg seed

2. Seed treatment with Chitosan @3.75g/kg seed
3. Seed treatment with *Pseudomonas fluorescens* @10g/kg seed
4. Seed treatment with *Bacillus subtilis* @10g/kg seed
5. Seed treatment with Carbendazim @2g/kg seed + 2 foliar sprays with *Pseudomonas fluorescens* @10g/lit water at Panicle initiation stage and grain filling stage.
6. Seed treatment with Chitosan @2g/kg seed + 2 foliar sprays with *Pseudomonas fluorescens* @10g/lit water at Panicle initiation stage and grain filling stage
7. Seed treatment with *Pseudomonas fluorescens* @10g/kg seed + 2 foliar sprays with *Pseudomonas fluorescens* @10g/lit water at Panicle initiation stage and grain filling stage
8. Seed treatment with *Bacillus subtilis* @10g/kg seed + 2 foliar sprays with *Bacillus subtilis* @10g/lit water at Panicle initiation stage and grain filling stage
9. Control

Centres: Bengaluru, Mandya, Vizianagaram, Jagdalpur, Ranchi, Ranichauri and Athiyandal

2. Cross inoculation studies in finger millet blast among leaf, neck, finger isolates to establish pathogenicity.

Centres: IIMR, Bengaluru, Ranichauri,

Note: All the centres has to supply infected leaf, neck, finger blast samples/cultures to the above units for establishing pathogenicity.

Trials/experiments concluded, deleted, modified and added:

A) Trials/experiments concluded:

- 1) Eco friendly management of banded sheath blight on foxtail millet, finger millet, kodo millet, proso millet and little millet.

B) Trials/experiments modified:

- 1) Titles of Donor screening nursery changed to National screening nursery in all small millets

c) Continued experiments:

S. No	Trial	Test centres
3.1	Survey and Surveillance for important diseases of finger millet and small millets (All centers)	
3.2	Evaluation of coordinated breeding material for diseases	
3.2.1	FMIVT (SZ)	Athiyandal, Bengaluru, Berhampur, Dindori Jagdalpur, Mandya, and Vizianagaram
3.2.2	FMIVT (NZ)	Almora, Ranchi and Ranichauri
3.2.3	FMAVT - I & II (SZ)	Athiyandal, Bengaluru, Berhampur, Dindori, Jagdalpur, Mandya, and Vizianagaram
3.2.4	AVT - I & II (NZ)	Almora, Ranchi and Ranichauri
3.2.5	KIAVT	Athiyandal, Bengaluru, Mandya, Nandyal Jagdalpur and Vizianagaram
3.2.6	FIAVT	Athiyandal, Bengaluru, Mandya, Nandyal, Ranchi, and Vizianagaram
3.2.7	LIAVT	Athiyandal, Bengaluru, Berhampur, Jagdalpur, Ranchi and Vizianagaram
3.2.8	BIAVT	Almora, Athiyandal, Bengaluru, Nandyal, Mandya, Ranichauri and

		Vizianagaram
3.2.9	PIAVT	Athiyandal, Ranichauri and Vizianagaram
3.3	National Screening Nursery (NSN)	
3.3.1	NSN –finger millet	Almora, Athiyandal, Bengaluru, Berhampur, Dindori, Jagdalpur, Mandya, Ranchi, Ranichauri and Vizianagaram
3.3.2	NSN-Kodo millet	Bengaluru Dindori, Jagdalpur, Vizianagaram
3.3.3	NSN-Foxtail millet	Athiyandal, Bengaluru, Nandyal, Ranchi and Vizianagaram
3.3.4	NSN-Little millet	Athiyandal, Bengaluru Berhampur, Ranchi, Jagadalpur and Vizianagaram
3.5	NSN- Barnyardmillet	Almora, Bengaluru Ranichauri Vizianagaram
3.3.6	NSN-Proso millet	Athiyandal, Bengaluru Ranichauri and Vizianagaram
3.4	Management of Finger millet blast. Action : Athiyandal, Bengaluru, Jagadalpur, Mandya, Ranichauri and Vizianagaram	
3.5	Cross inoculation studies in finger millet blast among leaf, neck, finger blast isolates to establish pathogenicity. Action: IIMR, Bengaluru, Ranichauri,	

Detailed Technical Programme: 2018-19

3.1: Survey and Surveillance for important diseases of finger millet and small millets (All centers)

All centres have to take up survey on finger millet diseases and cover large area to know the diseases and the extent of occurrence. Rowing survey preferably between flowering to grain filling is to be taken up. Data should be taken from five random points (four corners and centre. Refer picture below) from at least 1 m row length in the patches where there is maximum disease pressure. Location, severity index, variety, stage of crop, acreage etc. is to be mentioned in the report.

X				X
		X		
X				X

Note: X indicates location for taking observation

3.2. Evaluation of coordinated breeding material for diseases

3.2.1 FMIVT (SZ) : Athiyandal, Bengaluru, Berhampur, Dindori Jagdalpur, Mandya, and Vizianagaram

3.2.2 FMIVT (NZ): Almora, Ranchi and Ranichauri

3.2.3 FMAVT - I & II (SZ): Athiyandal, Bengaluru, Berhampur, Dindori, Jagdalpur, Mandya, Vizianagaram

3.2.4 AVT - I & II (NZ): Almora, Ranchi and Ranichauri

Note: Seeds of entries will be supplied by the Project Coordinating Unit, Bengaluru.

Checks: Blast: GE4441 (Resistant) ; *Uduru mallige*(Susceptible)

Methodology: (a) No. of replications - 3

(b) Plot size: 2 rows of 3 m length

- (c) Spacing: 22.5 cm x 10 cm
- (d) **Regular crop** production practices to be followed
- (e) To enhance susceptibility, application of extra Nitrogen is preferred at 25-35 days of crop growth.

Blast is the major and common disease in finger millet, so the spore suspension (measure the spore concentration) of this fungus isolated from the respective region has to be sprayed preferably in the evening hours at pre-flowering of the test entries. Provide sprinkler/ perfo / furrow irrigation frequently to create high humidity necessary for infection and disease development. Alternatively any one of the following methodologies may be adopted.

- Prepare separate seedbeds for raising the nursery. Sow the susceptible finger millet variety on the nursery bed 20-25 days before heading of the test varieties. Harvest the infected leaf material and make spore suspension and spray the spore suspension (measure concentration) on the test varieties. In addition to this, harvest the infected leaf material, chop into small bits and apply on the test varieties preferably in the evening hours (check for the pathogen spores in the leaf bits by suspending them in the water and examining under microscope). Provide high humidity by sprinkler/ perfo /furrow irrigation frequently.
- Prepare spore suspension by using sterilised leaf bits with Richard's solution, or barley grains 20 g, chopped leaves 1 g and distilled water 30 ml.
- Spray the spore suspension, once during the seedling/ tillering stage and twice during heading stage. Spraying has to be taken at the time when environmental conditions are favourable for disease expression viz., temperature around 26-30°C and humidity over 90% (preferably in the evening).

Observations: At seedling stage (30-40 days) for leaf blast; at dough stage for neck and finger blasts and sheath blight, brown spot, foot rot.

3.2.5 KIAVT: Kodo millet Initial and Advanced Varietal trial:

Locations: Athiyandal, Bengaluru, Mandya, Nandyal Jagdalpur and Vizianagaram

Diseases: Head smut, sheath blight and Udbatta

Checks: Banded Blight: RPS 745 -Resistant line; DPS12- Susceptible line
Head Smut: DRS 118- Resistant line; RPS-727 Susceptible line

3.2.6 FIAVT: Foxtail millet Initial and Advanced Varietal trial:

Locations: Athiyandal, Bengaluru, Mandya, Nandyal, Ranchi, and Vizianagaram

Diseases: Downymildew,blast and banded blight

Checks: Blast and Downy mildew: SiA-3282(Resistant line); SiA-3367(Susceptible line)

3.2.7 LIAVT: Little millet Initial and advanced varietal trial

Centres : Athiyandal, Bengaluru, Berhampur, Jagdalpur, Ranchi, Nandyal , Vizianagaram

Diseases: Grain smut, sheath blight, brown spot / leaf blight

Checks: Banded blight: RLM-208(Resistant line); DLM-95(Susceptible line)
Grain smut: DLM-95(Resistant line); RLM-223 (Susceptible line)

3.2.8 BIAVT: Barnyard millet Initial and advanced varietal trial

Centres: Almora, Athiyandal, Bengaluru, Nandyal , Mandya,Ranichauri ,Vizianagaram

Diseases: Head smut, grain smut, sheath blight and Brown spot ,leaf blight

Checks: Both to Grain Smut and Banded blight: PRB-903 (Resistant line) and
Local Dargi Ranichouri (LDR)-1(Susceptible line)

3.2.9 PIAVT: Proso millet Initial and advanced varietal trial

Centres: Athiyandal, Nandyal and Vizianagaram

Diseases: Sheath blight, Leaf blight and grain smut

Checks: TNPM-230 (Resistant line); Nilavoor local (Susceptible line)

Note: *The Project Coordinating Unit, Bengaluru will supply the seeds of test entries. **Susceptible and resistant checks of respective crops have to be sown along with test entries.** Raise good crop by following the recommended Cultivation practices of the region.*

3.3. National screening nursery (NSN)

- 3.3.1 NSN –finger millet: Athiyandal, Bengaluru, Berhampur, Jagdalpur, Mandya, Ranichauri and Vizianagaram (All diseases)
- 3.3.2 NSN-Kodo millet: Bengaluru Dindori, Jagdalpur, Vizianagaram (Head smut, sheath blight)
- 3.3.3 NSN-Foxtail millet: Athiyandal, Bengaluru, Nandyal, Ranchi and Vizianagaram (Blast, Downy mildew, Rust, Sheath blight, Smut)
- 3.3.4 NSN-Littlemillet: Athiyandal, Bengaluru, Berhampur, Ranchi, Jagdalpur, Vizianagaram (Grain smut, sheath blight)
- 3.3.5 NSN-Barnyard millet: Almora, Bengaluru Ranichauri Vizianagaram (Grain smut, Head smut, Sheath blight)
- 3.3.6 NSN- Proso millet: Athiyandal, Bengaluru Ranichauri and Vizianagaram (Banded blight, Rust and brown spot)

3.4. Management of Finger millet blast:

Treatments:

1. Seed treatment with Carbendazim @2g/kg seed
2. Seed treatment with Chitosan @3.75g/kg seed
3. Seed treatment with *Pseudomonas fluorescens* @10g/kg seed
4. Seed treatment with *Bacillus subtilis* @10g/kg seed
5. Seed treatment with Carbendazim @2g/kg seed + 2 foliar sprays with *Pseudomonas fluorescens* @10g/ltr water at Panicle initiation stage and grain filling stage.
6. Seed treatment with Chitosan @2g/kg seed + 2 foliar sprays with *Pseudomonas fluorescens* @10g/ltr water at Panicle initiation stage and grain filling stage
7. Seed treatment with *Pseudomonas fluorescens* @10g/kg seed + 2 foliar sprays with *Pseudomonas fluorescens* @10g/ltr water at Panicle initiation stage and grain filling stage
8. Seed treatment with *Bacillus subtilis* @10g/kg seed + 2 foliar sprays with *Bacillus subtilis* @10g/ltr water at Panicle initiation stage and grain filling stage
9. Control

Centres: Athiyandal, Bengaluru, Mandya, Jagdalpur, Ranchi, Ranichauri and Vizianagaram.

3.5 Cross inoculation studies in finger millet blast among leaf, neck, finger isolates to establish pathogenicity.

Centres: IIMR, Bengaluru, Ranichauri,

Note: All the centres has to supply infected leaf, neck, finger blast samples/cultures to the above units for establishing pathogenicity.

Standard Evaluation System for small millet diseases (SES scale)

I. Blast

A) SES for Leaf blast

Score	Description
1	Small brown specks of pinhead size without sporulating centre.
2	Small roundish to slightly elongated, necrotic grey spots, about 1-2 mm in diameter with a distinct brown

	margin and lesions are mostly found on the lower leaves.
3	Lesion type is the same as in scale 2, but significant numbers of lesions are on the upper leaves.
4	Typical sporulating blast lesions, 3 mm or longer, infecting less than 2% of the leaf area.
5	Typical blast lesions infection 2-10% of the leaf area.
6	Blast lesions infecting 11-25% leaf area.
7	Blast lesions infecting 26-50% leaf area.
8	Blast lesions infecting 51-75% leaf area.
9	More than 75% leaf area affected

B) Score chart for neck and finger blasts:

Neck and finger infections must be observed at the milky or dough stage and the per cent finger and / or neck blast will be recorded. Finger blast may be scored on the basis of percentage of finger infection (number of fingers infected out of the total fingers).

$$\text{a) Neck blast (\%)} = \frac{\text{Number of infected panicles}}{\text{Total number of panicles}} \times 100$$

$$\text{b) Finger blast (\%)} = \frac{\text{Number of infected fingers}}{\text{Average no. of fingers per plant} \times \text{Total number of panicles}} \times 100$$

Note: Average number of fingers is to be recorded from at least five panicles

Incidence of severely neck infected panicles: SES Scale for rating entries

Score	Description	Reaction
0-1	Less than 5%	R
1.1-3	5-10%	MR
3.1-5	11-25%	MS
5.1-7	26-50%	S
7.1-9	More than 50%	HS

II. SES Scale: Brown spot and Cercospora leaf spot diseases

Score	Description	Reaction
1	Less than 1% leaf area affected	R
2	1-3% leaf area affected	MR
3	4-5% leaf area affected	MR
4	6-10% leaf area affected	MS
5	11-15% leaf area affected	MS
6	16-25% leaf area affected	S
7	26-50% leaf area affected	S
8	51-75% leaf area affected	HS
9	76-100% leaf area affected	HS

III. Sheath blight disease: SES Scale (1996)

Score	Description	Reaction
0-1	Vertical spread of the lesions up to 20% of plant height	R
1.1-3	Vertical spread of the lesions up to 21-30% of plant height,	MR
3.1-5	Vertical spread of the lesions up to 31-45% of plant height	MS
5.1-7	Vertical spread of the lesions up to 46-65% of plant height.	S
7.1-9	Vertical spread of the lesions up to 66-100% of plant height	HS

IV. Incidence of severely sheath rot affected tillers: SES Scale (1996)

Score	Description	Reaction
0-1	Less than 1% sheath area affected	R
1.1-3	1-5% sheath area affected	MR
3.1-5	6-25% sheath area affected	MS
5.1-7	26-50% sheath area affected	S
7.1-9	51-100% sheath area affected	HS

V. Scale: Grain smuts (finger millet, barnyard, foxtail, little millet): SES Scale

Score	Description	Reaction
0-1	Less than 1% grains in a panicle affected	R
1.1-3	1-5% grains in a panicle affected	MR
3.1-5	6-25% grains in a panicle affected	MS
5.1-7	26-50% grains in a panicle affected	S
7.1-9	51-100% grains in a panicle affected	HS

VI. Incidence of Rust: SES Scale

Score	Description	Reaction
0-1	Pinhead flecks with no sporulation	R
1.1-3	Small scattered erumpent pustules with little sporulation	MR
3.1-5	Clear many erumpent pustules containing numerous spores	MS
5.1-7	Many coalescing pustules covering < 50% leaves	S
7.1-9	Many coalescing pustules covering most (>50%) leaves	HS

VII. Head smut of kodo millet:

$$\text{Head smut (\%)} = \frac{\text{Number of smutted panicles}}{\text{Total number of panicles}} \times 100$$

VIII. Udbatta disease:

$$\text{Udbatta (\%)} = \frac{\text{Number of transformed panicles}}{\text{Total number of panicles}} \times 100$$

$$\text{IX. Disease severity or Infection index (PDI)} = \frac{\text{Sum of all disease rating}}{\text{Total no. of rating} \times \text{maximum disease grade}} \times 100$$

(Wheeler, 1969)

The per cent disease incidence (PDI) in each variety is also to be recorded.

For sheath blight and head smut, number of infected plants in the entire plot/treatment is counted to compute the percentage infection (PDI).

X. In order to relate the productivity loss to **downy mildew** severity, disease severity scores are taken on individual plant basis at crop maturity using a 1-5 scale (Thakur RP, Sharma Rajan and Rao VP, 2011) where

- 1 = No infection;
- 2 = 20% productive tillers infected;
- 3 = 50% productive tillers infected;
- 4 = 80% productive tillers infected; and
- 5 = All tillers infected or total plant killed.

Disease severity (%) = $\frac{\{(1-1).n_1 + (2-1).n_2 + (3-1).n_3 + (4-1).n_4 + (5-1).n_5\}}{(5-1).N} \times 100$ where n₁, n₂, n₃, n₄, and n₅ are total number of plants in each of 1 to 5 rating class, and N is the total number of plants in a plot.

Technical programme for the year 2018-19

4. Agricultural Entomology

- Chairman** : Dr. S. S. Shaw
Professor (Former Dean and Director of Student welfare)
Indira Gandhi Krishi Vishwavidyalaya (IGKV)
Raipur, Chhattisgarh
- Co-chairman:** Dr. V. K. Dubey
Professor and Head (Department of Entomology)
Indira Gandhi Krishi Vishwavidyalaya (IGKV)
Raipur, Chhattisgarh
- Convener** : Dr. Prabhu C Ganiger
Entomologist and PI
PC Unit (Small Millets), GKVK., Bangalore
- Rapporteur** : Mrs. Dr. Ipsita O.P. Mishra,
Entomologist,
AICRP on Small Millets,
Centre for Pulse Research (OUAT),
Berhampur, Odisha

The agricultural entomology discipline meeting began with welcome by Dr. Prabhu Ganiger, PI (Ag. Entomology). In his opening remarks the chairman Dr. S. S. Shaw, suggested the all the entomologists to know the pest scenario/status of insect pests in different centres. Dr. V K Dubey, suggested all the scientists to keep eye on predators and parasitoids and also suggested any possibility of managing pest through biological means.

Introduction

The prime objective of the small millet improvement program is to increase and stabilize crop production in the millets growing areas at National level. To achieve this goal, it is necessary to provide the national programs with genotypes which have higher and stable yield potential than those currently grown by the farmers. One of the important objectives of AICRP on small millets research program is to identify improved sources of resistance for various insect pests from the national germplasm. To ensure that such resistance is broad based, it is necessary to test the material under various levels of insect infestation and under different environmental conditions through AICRP collaboration.

Technology Recommended:

1. **Low cost management of shoot fly in little millet**
The spraying of 1500ppm azadirachtin (0.15 per cent) (4 ml/litre of water) at 15 DAS reduced the incidence of Shoot fly.
2. **Low cost management of shoot fly in Proso millet**
Spray with 1500 ppm azadirachtin (0.15 per cent) (4 ml/litre of water) at 15 DAS followed by early sowing before the normal sowing will reduce dead heart incidence of shoot fly

The following people present and discussed previous year and technical programmes of 2018-19

1. Dr. Prabhu Ganiger, PI and Entomologist, PC Unit, Bangalore
2. Dr. M K Chakravarthy, Entomologist, Birsa Agricultural University, Ranchi (Jarkhand)
3. Dr. S. K. Choubey, Scientist Entomology, RARS, JNKVV, Dindori (M.P)
4. Miss. Dr Ipsita O. P. Mishra, Entomologist, OUAT, Berhampur (Odisha)

Trials/experiments concluded, deleted, modified and added:

- A) Trials/experiments excluded/ deleted for 2018: 1
 B) Trials/experiments Modified:
 C) New trials formulated: Two

New research Trials:

- Shoot fly screening nursery (SSN)** : All entomologists should keep their own SSN. Available germplasms will be procured from different plant breeders of small millets and then will be screened against shoot fly. From this you can develop your own/ local susceptible and tolerant variety for insect pests of small millets.
Dindori, Berhampur, Bangalore
- Mapping of biogeography of shoot flies of small millets (Species composition) (Centre : Bangalore)

Details of experiments allotted to different centers

Trial No.	Name of Trial	Centres
4.1	Pest survey, surveillance, mapping and seasonal incidence	
4.1.1	The Survey, seasonal incidence with different dates of sowing on incidence of insect pests of finger millet	Bangalore,, Berhampur and Ranchi
4.1.2	The survey, seasonal incidence with different dates of sowing on incidence of insect pests of small millets Ranchi : Little millet Dindori : Little millet Berhampur : Little millet Bangalore : Little millet, Foxtail millet,, Barnyard millet, Proso, Kodo millet Ranichauri : Barnyard millet	
4.1.3	Systematic study on alternate hosts for shoot fly in all small millets Ranchi : Little millet Dindori : Little millet and Kodo millet Berhampur : Little millet Bangalore : Little millet, Proso millet, Foxtail millet, kodo millet	
4.1.4	Mapping of biogeography of shoot flies of small millets (Species composition) (work at Bangalore centre)	All
4.2	Multi-pest resistance screening of small millets	
4.2.1	Multi-pest resistance screening in finger millet (IVT, AVT I & II)	Bangalore, Berhampur and Ranchi
4.2.2	Evaluation of kodo millet advanced varieties against shoot fly (KIAVT)	Bangalore, Dindori, Ranchi,
4.2.3	Evaluation of little millet advanced varieties to shoot fly (LIAVT)	Bangalore, Berhampur, Dindori, Ranchi,
4.2.4	Evaluation of proso millet advanced varieties to shoot fly (PIAVT)	Ranchi, Bangalore, Dindori
4.2.5	Evaluation of foxtail millet advanced varieties to shoot fly (FIAVT)	Bangalore, Ranchi, Dindori
4.2.6	Evaluation of barnyard millet advanced entries to shoot fly (BIAVT)	Bangalore, Ranichauri
4.2.7	Evaluation of brown top millet advanced entries to shoot fly (BTIVT)	Bangalore, Berhampur
4.2.8	Shoot fly screening nursery (Based on availability of seeds)	Berhampur, Bangalore
4.3	Management of stem borer	
4.3.1	Stem borer management in finger millet	Berhampur

4.4	Studies on storage grain pests and storability in small millets	
4.4.1	Enumeration of stored grain pests, incidence level and storability of milled rice Ranchi, Bangalore, Berhampur - Finger millet - white ragi compare with brown ragi Dindori, Bangalore : Kodo and Little Millet	

Suggestions/recommendations

After the discussion and deliberation with scientists, the chairman and co-chairman made the following suggestions/recommendations:

1. Based on the earlier literatures develop pest status scenario of shoo flies.
2. Shoot fly screening nursery should be initiated.
3. Collected specimens of all insect pests of small millets should be sent to main centre for identification.(Predators/parasitoids/ spiders to be identified from taxonomists)
4. Suggested to take observation of dead heart symptom based on main shoot only
5. Identify preferred host/trap crop (grasses) for shoot fly
6. Compile the ten years data to know the susceptible and resistant varieties/germplasms for screening of all the small millets.

Dr. Prabhu Ganiger, Entomologist, P.C. Unit, UAS, Bengaluru, thanked Chairman and Co-chairman and all the participants, on behalf of the project Coordinating Unit, ICAR for contributing their input to refine the technical programme.

Technical programme of Small millets entomology for 2018-19

Based on discussion technical programme as follows

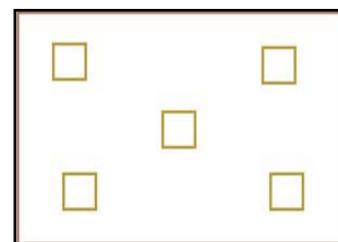
4.1 Pest survey, surveillance, mapping and seasonal incidence

4.1.1.1: Survey for insect pests of Finger millet (*Eleusine coracana*)

Pest surveillance is the most important and integral part of IPM technology. It involves direct measurement of pest or disease occurrence, development of population and damage at regular intervals. Usually, sampling 25 plants in 5 clusters of the plot at 7-10 days interval is suitable for ascertaining insect pest levels, natural enemy populations.

Methodology for Random field survey:

During the survey the villages having large area under finger millet, will be selected randomly. Farmer's field has to be selected for surveillance and will be contacted and details of his crop will be noted in the following proforma. The surveyor will walk inside the field in 'X' or 'Z' manner and sample the plants at five spots randomly as shown in figure (four in the corners, at least 5 feet inside the borders and one in the centre). At each spot select ten random plants for recording observations of insect pests as follows



1. **Grass hoppers** : number/meter and per cent damage (Randomly counting ten plant per replication, totally 30 plants with GH damage to calculate per cent and also record the per cent damaged leaves)
2. ***Myllocerus* sp.** : number/metre
3. **Stem borer** : Per cent dead hearts 30 plants(Randomly counting ten plant per replication) (expressed as per cent basis and per cent larvae)
4. **Earhead caterpillar, *Helicoverpa armigera*** : Per cent (Eggs/egg mass, larvae)
5. **Aphids** : presence of number of aphids and per cent affected plants/ panicles

6. **Defoliators** (RHC, *Spodoptera* sp.) : Number of Larvae per ten plants per replication total of 30 plants and per cent defoliated plants for 30 plants

7. Natural enemies :

Egg parasitoids : Collect 50 eggs of lepidopterans in case of singly laid eggs and 3 egg masses for *Spodoptera* sp. and others which lay eggs in masses. Incubate them in the lab and observe for parasitoid emergence and express as per cent parasitisation. Get the parasitoid identified from taxonomist.

Larva: Count the parasitized or disease affected larvae in the field and express as per cent affected. Also, about 50 larvae could be brought to lab and reared for the emergence of parasitoids from them and express as per cent affected.

Predators: Predators such as adults of chrysoperla, syrphids and coccinellids, predatory bugs, spiders can be counted along larval counts of pests and expressed as number per square meter.

4. 1. 1.2: Seasonal incidence of insect pests on finger millet

Methodology:

To study the seasonal incidence of pests with different dates of sowing, take up sowing at staggered intervals of fifteen days interval starting from beginning of the season and continue at least two sowings after the completion of season. Based on standard weeks, the insect pests of finger millet with their natural enemies (grey weevil, grasshopper, shoot aphids, stem borer and earhead caterpillars) will be observed **weekly** with different stages of crop. Further, this data can be correlated with weather parameters.

Plot size: 2.0 meter x 2.25 meter (**Each date of sowing will have three plots to maintain replication**)

Variety: Popular variety of your region. First sowing should be based on your (farmers') normal sowing

Note: The crop should be raised under protective irrigation where ever necessary

S. No.	Different dates sowing	Centres	Record (Weekly)
1	30 th June	Bengaluru, Berhampur, Kanke (Ranchi)	<ul style="list-style-type: none"> • Insect pests and its natural enemies • Weather parameters
2	15 th and 30 th July		
3	15 th and 30 th August		
4	15 th September		

4.1.2 The seasonal incidence with different dates of sowing on incidence of insect pests of small millets

Ranchi: Little millet

Dindori: Little millet

Berhampur: Little millet

Bangalore: Little millet, Foxtail millet, Barnyard millet, Proso, Kodo millet

Ranichauri: Barnyard millet

To know the seasonal incidence of insect pests with different dates of sowing; sowing will be carried out at staggered intervals of fifteen days interval starting from beginning of the season and continue at least two sowings after the completion of season. Based on standard weeks, the insect pests of small millets with their natural enemies (dead heart by shoot fly, grass hopper, leaf roller, gall midge, flea beetles, ants, aphids, bugs etc) will be observed **weekly** with different stages of crop.

Parasitoids: To observe parasitoids, randomly collect the dead heart symptomed plant samples and kept in polythene covers for parasitoid emergence and also for the adults of shoot fly and gall midges. (small holes should be made on covers for aeration).

Plot size: 2.0 meter x 2.25 meter (**Each date of sowing will have three plots to maintain replication**)

Variety: Popular variety of your region

S. No.	Different dates sowing
1	30 th June
2	15 th and 30 th July
3	15 th and 30 th August
4	15 th September

4.1.3 Systematic study on alternate hosts for shoot fly in all small millets

Ranchi: Little millet

Dindori: Little millet and Kodo millet

Berhampur: Little millet

Bangalore: Little millet, Proso millet, Foxtail millet, kodo millet

Different small millets will be sown with plot size of 2.0 meter x 2.25 meter. **Three such plots will have to be maintained as replication** during the kharif for higher pest pressure. The crop is to be grown along with weeds and ten days after sowing, thinning should be carried out to facilitate shoot fly to lay eggs. Search for hosts of shoot fly stages viz., egg, maggot and deadhearts in grassy species of weeds in and around the crop at experimental station (or also at survey period) and also examine for survival of shoot fly during the off season to find out hibernation if any. Examine the crop residue also to ascertain for any hibernation. The weed host plants affected with shoot fly i.e with dead heart symptom should be identified with the help of botanist and then weed should be kept in polythene bag for the emergence of adult shoot fly.

4.1.4 Mapping of biogeography of shoot flies of small millets (Species composition)

(Work at Bangalore centre) (All centers should send the specimens)

Sampling of shoot fly : Sampling of insects in different habitats can be done by using fishmeal traps, net sweeps and by collecting dead heart plants and then kept it in plastic bags for adult emergence. Such emerged adults should be sent to the main centre for identification of shoot fly species. By knowing the habitats/place of that species, biogeographical mapping of species composition/diversity of shoot fly can be assessed.

4.2. Multi-pest resistance screening of small millets

4.2.1: Evaluation of finger millet IVT and AVT against insect pests (FMIVT and FMAVT)

Pests: Grey weevil, grasshoppers, aphids, cutworms, stem borers, earhead caterpillars and shoot fly.

Observe the pest incidence on **thirty** randomly selected plants in each replication of a treatment. The data of each replication, treatment wise should be pooled and then converted into per cent incidence. The ideal plot size should be **2 rows (30 cm apart) with 3 meter length**. The crop should be thinned ten days after seedling emergence; with a plant to plant distance of 7.5 - 10 cm. Based on the past data (ten years) the susceptible and resistant varieties/germplasm may be recognized for screening of all the small millets. **(Annexure -I)**.

: Three or Four

Design : RBD

Replication

Centres : Bangalore, Ranchi and Berhampur

4.2.1.1 Studies on identification of natural enemies of major pests of ragi

- a) Natural enemies of earhead caterpillars % parasitization /predation **Centre:** Berhampur
- b) Shoot and root aphid natural enemies **Centre:** Bangalore

Procedure:

1. **Earhead caterpillars:** Observe the caterpillars paralyzed, suspected due to parasitization, collect such caterpillars in a cage and observe for emergence of parasites. The parasites will emerge within a week to ten days. The parasites thus collected may be preserved in vials containing 70 % alcohol for further identification and study.
2. **Shoot and root aphids:** Collect the adult predators of aphids by using an aspirator from aphid infested crop. Observe for mummified aphids. If found, collect them in a petridish and bring it to the laboratory. If the mummification is due to parasitization, the parasites will emerge. Preserve these parasites by carefully transferring them by using camel hair brush into a vial, containing 70 % alcohol. The specimens collected may be sent to co-ordinating unit, Bangalore for identification.

Note: The material raised under project SM (E) 402 may be used for this study. In course of study on natural enemies of pests of finger millet; If you happen to collect parasites of shoot and root aphids, collect them in 70 % alcohol in vials and dispatch to PI (E), coordinating unit Bangalore for identification.

4.2.1.2 Stem borer screening nursery

Methodology: Two rows of three meter length for each variety with a row spacing of 22.5 - 30 cm may be grown in three replications. IVT entries showing less, moderate and high incidence of stem borer in Kharif-2016 or based on previous year's data should be selected and further tested during the summer season. In addition released and pre released varieties and local promising varieties including released varieties may also be screened.

Observations: The incidence of stem borer should be recorded as per cent incidence by counting the entire population under each treatment (**Annexure-I**).

Centre: Berhampur, Bangalore

4. 2. 2 Evaluation of kodo millet (*Paspalum scrobiculatum*) initial advanced varieties against shoot fly(KIAVT)

Design : RBD

Plot size : 3 rows of 3 meter length

Record the total number of germinated plants at **ten** Days After seedling Emergence (DAE), number of plants with eggs, plants with deadhearts, and the total number of plants at 14, 21, 30 and 45 DAE. **Oviposition** percentage is calculated at **14 and 21 DAE** by multiplying with 100, the ratio of number of plants with eggs to total number of plants. Similarly, the dead heart percentage is calculated by calculating the ratio of number of plants with **dead heart** to total number of plants and multiplying with 100 at **30 and 45 DAE**. If possible, also record the number of tillers, and tillers with panicles at maturity as a measure of genotype's recovery resistance (ICRISAT, 1997) (**Annexure-II**).

4.2. 3 Evaluation of little millet (*Panicum miliare*) initial advanced varieties to shoot fly (LIAVT)

Design : RBD

Plot size : 2 rows of 3 meter length

Material : Coordinating unit will supply seeds

Centres : Bangalore, Ranchi and Dindori

Record the total number of germinated plants at 10 DAE, number of plants with eggs, plants with deadhearts, and the total number of plants at **14, 21 and 28 days** after seedling emergence. Oviposition percentage is calculated at **14 and 21 DAE** by multiplying 100 with, the ratio of number of plants with eggs to total number of plants. Similarly, the dead heart percentage was calculated by calculating the ratio of number of plants with **dead heart** to total number of plants and multiplying with 100 at **14, 21 and 28 DAE**. If possible, also record the number of tillers, and tillers with panicles at maturity as a measure of genotype's recovery resistance (ICRISAT, 1997) (**Annexure-II**)

Centre: Bangalore, Ranchi, Berhampur and Dindori

4.2. 4 Evaluation of Proso millet (*Panicum miliaceum*) initial advanced varieties to shoot fly (PIAVT)

Follow the method as in LIAVT 402.3.

Centre: Bangalore, Ranchi and Dindori

4.2. 5 Evaluation of foxtail millet (*Setaria italica*) initial advanced varieties to shoot fly (FIAVT)

Follow the method as in LIAVT 402.3.

Centre: Bengaluru and Dindori

4.2.6 Evaluation of barnyard millet (*Echinochloa frumentacea*) initial advanced entries to shoot fly (BAIVT)
Follow the method as in LIAVT 402.3. Centre: Bengaluru and Ranichauri

4.2.7 Evaluation of brown top millet initial advanced entries to shoot fly (BTIAVT)

Centre: Bengaluru and Berhampur

4.2.8 Shoot fly screening nursery (SSN) (Based on availability of seeds from breeders)

All entomologists should keep their own SSN. Available germplasms will be procured from different plant breeders of small millets and then will be screened against shoot fly. From this you can develop your own/ local susceptible and tolerant variety for insect pests of small millets.

4.3: Management of stem borer

4.3.1 Stem borer management in finger millet

Design: RCBD Replication: 3 Season: Summer Variety: Bhairabi Centre: Berhampur

S. No.	Treatment	Dosage	Interval/ spraying at stage of crop
1	Release of <i>Trichogramma chilonis</i> as biocontrol agent	50,000/- per hectare	7 days interval
2	Foliar spray of Neem Pesticide	0.03% (300 PPM) @ 5 ml./ l water	
3	Foliar spray of Bt (<i>Bacillus thuringensis</i>)	2g /L	
4	NSKE	5%	15DAS
5	NSKE	5%	25DAS
6	NSKE	5%	35 DAS
7	Control		

4.4 Studies on storage grain pests and storability in small millets

4.4.1 Enumeration of stored grain pests, incidence level and storability of milled rice

Ranchi, Bangalore, Berhampur: Finger millet - white ragi compare with brown ragi

Dindori, Bangalore: Kodo and Little Millet Bangalore : Little millet, Proso millet, Foxtail millet, kodo millet

Half a kilogram of milled rice will be kept for insect observation. Collect insect pests that occur on this stored milled rice and preserve in alcohol. Then specimen should be sent for identification. Observations may be recorded at weekly intervals for six to eight weeks. The pest incidence and per cent loss or damage due to pest may be worked out. For this two set of experiment must be designed, one for incidence and loss assessment another for control. The pest incidence may be recorded based on the known quantity should be scooped out from the sample and record the incidence at weekly interval. To calculate the loss, initial weight and weight at end of the week (from the control) should be recorded at weekly interval.

Replication: 4 Sample size: Half kg (250 g each set)

Feeler trial at specific centre:

Little millet (*Panicum miliaceum*)

1. Seasonal incidence and assessment of loss due to blister beetle on little millet

Methodology: To study the seasonal incidence of pests in particular of blister beetles, based on standard weeks, the crop will be observed weekly at different stages of crop. Further, using this data correlate the incidence of blister

beetle with weather parameters. The crop loss can be assessed by protected/treated with insecticides/ management and untreated with any insecticides. Yield per ha has to be recorded in protected and unprotected condition of the crop.

Centre : Dindori

Note: Seed entries of advanced and germplasm for evaluation trial of all crops will be sent by the PI (E) Co-ordinating Unit, Bengaluru.

Dr. Prabhu Ganiger, Entomologist, P.C. Unit, UAS, Bengaluru, thanked Chairman and Co-chairman and all the participants, on behalf of the project Coordinating Unit, ICAR for contributing their input to refine the technical programme.

AICRP Technical Programme: Small Millet Entomology-Kharif 2017-18

Trial No.	Name of the trial	Entries	Replication	Plot size (Row x m)	Centers					Total
					Bangalore	Berham pur	Dindori	Ranchi	Ranichauri	
4.1	Pest survey, surveillance, mapping and seasonal incidence with different dates of sowing									
4.1.1	Different dates of sowing- finger millet		3	2m X 2.25 m	1	1		1	1	4
4.1.2	Different dates of sowing- Small millets		3	2m X 2.25 m	1	1	1	1		4
4.1.3	Alternate hosts for shoot fly		3	2m X 2.25 m	1	1	1	1		4
4.1.4	Mapping of biogeography of shoot flies				1	1	1	1	1	5
4.2	Multi-pest 2r x 3m resistance screening trial									
4.2.1	FM-IVT, AVT I & II		3	2r x 3m	1	1		1		3
4.2.2	KIAVT		3	3r x 3m	1		1	1		3
4.2.3	LIAVT		3	2r x 3m	1	1	1	1		4
4.2.4	PIAVT		3	2r x 3m	1		1	1		3
4.2.5	FIAVT		3	2r x 3m	1		1	1		3
4.2.6	BIAVT		3	2r x 3m	1				1	2
4.2.7	BTIAVT		3	2r x 3m	1	1				2
4.2.8	Shoot fly -SSN		3	2r x 3m	1	1				2
4.3	Management of stem borer									
4.3.1	Stem borer management in finger millet *					1				1
4.4	Stored pests of small millets									
4.4.1	Storability of milled rice in all small millet crops and enumerate the stored grain pests and its incidence level				1	1	1	1		4
	Total				13	10	8	10	3	44

* Summer experiment

Screening of insect pests of finger millet

1. **Screening of Stem borer:** Visual damage rating scale for deadheart formation and chaffy and broken panicles caused by borer infestation. Record the total number of plants, plants showing borer deadhearts, and the visual score (1-9) for deadhearts.

Scores	Dead heart/ chaffy broken panicles (%)
1	< 10
2	10 - 20
3	21 - 30
4	31 - 40
5	41 - 50
6	51 - 60
7	61 - 70
8	71 - 80
9	> 80

2. **Aphid density:** Injury rating based on visual scoring to screen for resistance to Aphids. At peak infestation, evaluate the test genotypes for aphid resistance by recording aphid density. For this, count the number of aphids in a unit area on three leaves, and record observations on five plants selected at random from each genotype. This can be evaluated in a 1 to 9 scale (where 1 = a few aphids present with no apparent damage to the leaves, and 9 = heavy aphid density on infested leaves).

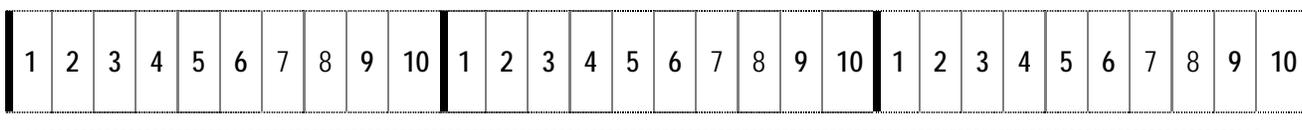
Aphid density/injury rating	Aphid density/injury (%)
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	64-70
8	71-80
9	>80

3. **Defoliators:** The test lines can be screened by using 1-9 scale scoring where 0= No damage and 9 = 81-100% foliage destroyed. (Defoliators include RHC, *Spodoptera* sp., grey weevil, grasshopper etc)

Rating	Leaf area damaged (%)
0	No damage
1	1-10
2	11 - 20
3	21 - 30
4	31 - 40
5	41 - 50
6	51 - 60
7	61 - 70
8	71 - 80
9	81 - 100

Screening of small millets against shoot fly

Diagram represents the screening trial for shoot fly



- Thick line represents the susceptible germplasm/variety and dotted line also represents the same
- These susceptible line should be sown ten to 15 days before the screening of germplasm lines
- Numerical numbers (variable) represents actual germplasm lines needs to be screen/evaluate

1. **Shoot fly** :Based on per cent dead hearts by shoot fly, the germplasms are grouped in to five categories

Sl. No.	Level of tolerance	Score	Per cent deadheart
1	Highly tolerant	1	≤ 10% infestation
2	Tolerant	3	10 to 20% infestation
3	Moderately tolerant	5	20 to 35% infestation
4	Susceptible	7	35 to 50% infestation
5	Highly susceptible	9	≥50% infestation

Monitoring adult populations of shoot fly : Studies on the population monitoring of the pest was carried on small millets. During study period the pest population was observed on crops grown during the August-October and October –January months by employing Fish meal trap.

Fish meal trap: Moistened fish should be kept for attraction of shoot flies. Fish meal changed once in five days. The flies from the trap were collected every day morning with help of wire mesh/ hair brush from sieved material. The specimens collected from the trap should be labeled and then send it for identification.

Observation units for seasonal incidence and screening of varieties for insects pests of small millets :

S No.	Pest/Resistant parameters	Observation Unit
1	Plant population at 10 Days After Emergence (DAE) (No.)	Number in per cent
2	Grass hoppers	Numbers/ meter row
3	<i>Mylocerus</i> sp. weevil	Number/ meter row
4	Earhead caterpillar	Number/ ten panicles
5	Aphids Rating (1-9)	Per cent affected and Number/3 leaves
6	Defoliators (Infested)	Per cent
7	Stem borer deadhearts (%)	Per cent
8	Shoot fly eggs/5 plants at 14 and 21 DAE (No)	Number
9	Shoot fly deadhearts (%) - at peak time (14, 21, 28) (30 and 45 in Kodo millet)	Per cent
10	Grain yield of three rows of screening germplasm (in replicated)	Gram

Technical programme for the year 2018-19

5. Frontline demonstrations

Chairman : Dr. N Pandey, Professor and head, Department of Agronomy, IGKV, Raipur
Co-chairman : Dr. B. Boriah, Associate Professor of Agronomy and Ex PI (AICRP SM), GKVK, Bengaluru
Convener : Dr. Sukanya T.S., Agronomist, PC unit, GKVK, Bengaluru
Rapporteurs : Smt. Shubhashree K.S., Mandya and Dr. Ajaykumar, Ranichauri

The concurrent session on Frontline demonstrations began with the welcome of the Chairman, Co-chairman and other scientists from different AICRP centers by Dr. Sukanya T. S., PI Agronomy.

At the outset the chairman welcomed the gathering and stressed to adopt all improved practices in farmers field to improve the productivity. FLD Studies involving 331 hectares of land under various small millets were carried out by various centers across the country during Kharif 2017-18 depicting the improved management practices to realize the remunerative returns in small millets and improve their livelihood of small millet farmers.

Improved package of practices for Minor millets

The following recommended practices were advocated to implement in the FLD programme. However, all the Practices could not be followed uniformly by the FLD farmers of the different regions due to various practical reasons. The precaution was taken to maintain similar situation by using same inputs to both FLD and local cultivars in the Farmers' fields.

Sowing time:	2nd fortnight of June to 1st fortnight of August
Seed rate:	8-10 kg/ha (3 – 4 kg/acre)
Spacing:	Row to row 22.5 - 30 cm and plant to plant 7.5 to 10 cm
Plant population:	3.33 – 4.44 lakh per ha
Seed treatment:	Azospirillum brassilense and Aspergillus awamouri 25 gm/ Kg of seeds
Fertilizer dose (N: P₂O₅:K₂O):	50:40:25 kg /ha NP ₂ O ₅ K ₂ O for rainfed and 100:50:50 kg /ha for Irrigated (Finger millet), other small millets 40:20:0 kg /ha NP ₂ O ₅ K ₂ O (50% N and full P ₂ O ₅ and K ₂ O as basal and 50% N at 30-35 days after sowing)
Irrigation:	I st at germination, II nd at panicle initiation and III rd at grain filling stage, if available
Weed management:	Spray of Isoproturon @ 0.5 kg a.i./ha immediately after sowing, inter-cultivation 2 times at 25 and 35- 40 DAS
Plant protection:	Need-based soil application of Carbofuron 3G @ 2 g/m at sowing,

Proposal of FLD's on Small Millets for the year 2018-19

S. NO.	Center	Finger millet	Foxtail millet	Little millet	Kodo millet	Proso millet	Barnyard millet	Total Area. ha
1	P.C. unit	20	5	-	5	-	-	30
2	VPKAS Almora	10	-	-	-	-	5	15
3	Mandya	20	-	-	-	-	-	20
4	Hagari	-	10	-	-	-	-	10
5	Nandyal	-	20	-	-	-	-	20
6	Vizianagaram	15	-	10	-	-	-	25
7	Jagdapur	15	-	5	10	-	-	30
8	Athiyandal	5	5	5	5	5	5	30
9	Ranichauri	10	-	-	-	-	10	20
10	Dindori	-	-	15	15	-	-	30
11	Hanamanamatti	-	5	5	-	-	5	15
12	Kolhapur	15	-	5	-	-	-	20
13	Kanke	15	-	-	-	-	-	15
14	Waghai	10	-	10	-	-	-	20
	Total	135	45	55	35	5	25	300

Improved varieties to be demonstrated under FLDs through AICRP (SM) 2018-19

State	Finger millet	Foxtail millet	Kodo millet	Little millet	Barnyard millet	Proso millet
Karnataka	GPU-67, GPU-66 KMR 204, KMR 301	SiA 3088 SiA 3156	RK 390-25	-	-	-
Uttarakhand	VL-352, VL-376 VL-379, VL-348	-	-	-	VL 207 PRJ -1	-
Andhra Pradesh	VR 847	SiA 3088 SiA 3156	-	JK - 8 OLM 203	-	-
Madhya Pradesh	-	-	RK-390 -25 JK -98 JK-439	JK - 8 JK-36	-	-
Tamil Nadu	CO-15, GPU-28 CO-4	CO-7 SiA 3156	TNAU 86 CO-3	CO-4 OLM 203 TNAU 91	CO-2 VL 207	TNAU 202 CO-5
Maharashtra	KOPN-235	-	-	KOPLM-83	-	-
Chattisgarh	GPU 28, CG-2 Indira ragi	-	Indira kodo 1 RK 390-25	BL-4 BL-6	-	-
Jharkhand	GPU 67 BBM-10, A 404	-	-	-	-	-
Gujarat	GNN-6 GN- 7	-	-	GV-2 GNV-3	-	-

Part C: Appendices

Annexure-I

Press Note

The 29th Annual Group Meeting of ICAR-All India Coordinated Research Project on Small Millets was held at Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh on April 12-13, 2018. About 74 participants from various SAUs, voluntary centers, private companies and other collaborating institutes participated in the group meeting.

The group meeting was held in 8 different sessions spanned over two days. First day started with Inaugural Session. The group meeting was formally inaugurated by Shri Sunil Kumar Kujur, Agriculture production Commissioner, Govt of Chattisgarh under the chairmanship of Dr. IS Solanki, Assistant Director General (FFC), ICAR, New Delhi. Dr. SS Rao, Director of Research Services, IGKV, Raipur welcomed the delegates. Dr. Prabhakar, Project Coordinator (Small Millets), AICRP on Small Millets, ICAR, Bengaluru presented the research highlights of AICRP centers for the year 2017-18. Dr. OP Kashyap, Dean Agriculture, IGKV, Raipur proposed the vote of thanks.

In the afternoon, presentation of progress reports of various disciplines was made by respective Principal Investigators, followed by scientific auditing of each center and the scientists working under the AICSIP scheme so that the shortfalls could be identified and addressed effectively. Discipline-wise programme planning group meetings were held to review the results and finalization of technical programmes for the year 2018-19. In the evening Varietal Identification Committee meetings was held under the Chairmanship of Dr. IS Solanki, ADG (FFC), ICAR, New Delhi. Second day was dedicated to presentation of lead topics by distinguished speakers, followed by discussion on various issues related to AICRP activities and collaborative projects and administrative matters. Plenary session was held wherein presentation of session-wise recommendations and the final technical programmes of all disciplines were put for approval of the house. The plenary session was presided over by Dr. IS Solanki, ADG (FFC), ICAR and Dr. SS Rao, Director of Research Services, IGKV; Raipur was the Co-Chairman. Dr. Prabhakar, Project Coordinator (Small Millets) proposed vote of thanks.

Dr. Prabhakar, Project Coordinator (Small millets), Bangalore presented the research highlights of small millets for 2017-18, mentioning that all the six small millets are cultivated in all the states of India. Research work on small millets is going on in 13 AICRP and 21 co-operating centers. The year 2017-18 has been a very fruitful year for the project, since a total of 22 small millet varieties have been released and notified by Central Varietal Release Committee (76th to 79th CVRC meetings). Among them, there are 10 varieties in finger millet, 3 varieties each in foxtail millet and little millet, 2 varieties each in kodo millet, proso millet and barnyard millet. Six varieties are nationally released and 16 are released for different states. Two varieties, one each in proso millet and little millet are identified and yet to be released.

Dr. Prabhakar highlighted the performance of all the entries in six crops of small millets. Performance of AICRP breeding trial in 2017-18 and comparisons of 3 years were presented. Zonal concept was adopted for evaluation of entries only in finger millet along with national, zonal check and local checks. Accordingly, North zone and Southern zones were formulated and continued in 2017-18. Total of nine multi-location yield trials of six millets were conducted across locations. Against total allocation of 121 trials, comprising six millet crops, to various centers all over India, 108 trials were conducted and the overall success was 89.26%. The percent success ranged from 80% in Proso millet to 100% in Barnyard millet. Agronomical recommendations, Front line demonstrations, TSP, drought tolerance accessions of finger millet superior to GPU 28 were presented. Banded leaf blight is becoming major threat in all the small millets and soil application of bio-agents is effective in managing the disease. Scenario of insect pests in small millets and promising varieties with multi pest resistance were highlighted.

During *Kharif 2017-18*, 331 frontline demonstrations (FLDs) on small millets were organized across country. Latest varieties of small millets were demonstrated along with locally cultivar as a check in farmers' fields at different locations. The demonstrated varieties of finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet gave 54.83%, 60.43%, 47.29%, 57.07%, 67.08%, 71.59%, 74.28%, 44.96%, 106.76%, 80.61%, 154.32% and 107.33% higher grain and fodder yields respectively than the local checks.

Programme under Tribal sub plan resulted in introduction of finger millet in tribal populations for cultivation and also consumption. The TSP programme was carried out in five centres and the total area covered was 51.6 ha with 109 beneficiaries. For popularization of small millets in NEH Region, a total of Rs. 40.48 lakhs has been allocated three centres, for conduct of demonstration in farmer's fields in summer and kharif 2017 and summer 2018.

Against the indent, breeder seed allocation of 58.10q was made for production across 12 centres in 9 states. Accordingly, the total production of breeder seed was 67.13q and it is 101.89 % more than the allocation. A total of 448.0 kgs of nucleus seed of varieties of 85 varieties of 6 crops of small millets were produced by 17 centres.

Dr. I.S. Solanki, ADG (F&FC) ICAR New Delhi in his address first thanked the University authorities for providing the facilities to conduct the 29th Annual Group Meeting of Small Millets. He expressed his concern to for losing the area under small millets year after year and more than 50% area has been lost under finger millet and more than 7.5 times of area was lost under other small millet crops. However, he has also highlighted that, even though decrease in area the per unit or per hectare productivity is increased that is because of the different technologies developed by the scientist and collective efforts of farmers.

Dr. Solanki further mentioned that Government of India declared 2018 as a year of millet as the millets having nutritional quality and these crops are growing good under variable climatic conditions. These crops are early maturing and give sustainable yield under and richest source of calcium and other minerals. He also emphasized that, the number of varieties under these small millet crops are not sufficient, most of the farmers are growing land races available with them. We have to make big efforts for popularization and the adoption of new varieties and technologies developed so far. We have to regain the lost area under small millets. Value addition and milling of millets machinery required for millets is important aspect to boost the production.

Thereafter 17 publications and one book related to small millets from different centers were released on this occasion by the dignitaries. Important publications are as follows

1. Text Book on Diseases of Small Millets by TSSK Patro *et. al.* (Viziangaram centre)
2. Small Millet Insect pests by Prabhu Ganiger *et.al.* (PC Unit, Bengaluru)
3. Production, processing and value addition in Small Millets in Hindi by SC Yadav *et. al.* (Jagdarpur Centre)
4. Improved production Technology in Ragi and Little millet in Gujarati by Harshal Patil *et.al.* (Waghai centre)
5. The Oriental Armyworm and its Management by Prabhu Ganiger *et.al.* (PC Unit, Bengaluru).

Shri. Sunil Kumar Kujur, IAS, Agriculture, Production Commissioner Govt. of Chhatisgarh in his presidential remarks highlighted that we should work for the benefits for the farmers. Farmers' income should be increased or we should make efforts for doubling the farmers' income. Now a day the market strategies is becoming difficult in that case we have to help the farmers for their production. The concrete recommendation should emerge for the benefits of farmer from this workshop.

Four farming groups from Bastar districts of Chhatisgarh were facilitated for their valuable work in small millets value addition and processing of millets by the dignitaries.

Acknowledgements

Project Coordinating Unit, AICRP on Small Millets, ICAR, GKVK, Bengaluru is sincerely thankful to Dr. TR Mohapatra, Secretary, DARE and Director General, ICAR and Dr. AK Singh, Deputy General (Crop Sciences), ICAR for giving permission to hold the 29th Annual Group Meeting of AICRP on Small Millets at Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh on April 12-13, 2018. We are grateful to Dr. IS Solanki, Assistant Director General (FFC), ICAR for his constant support, guidance and valuable suggestions to plan and conduct the group meeting successfully.

We also express our sincere thanks to Dr. S. K. Patil, Vice-Chancellor, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh for kindly accepting our invitation to be as Chairman of the Inaugural function. We are highly grateful to Shri Sunil Kumar Kujur, Agriculture Production Commissioner, Govt of Chattisgarh to be as Chief Guest of the Inaugural function at a short notice. Also, we express sincere gratitude to Dr. IS Solanki, Assistant Director General (FFC) to be as Guest of Honour.

Our special thanks to Dr. S. S. Rao, Director of Research Services, for chairing various technical sessions and guiding the group. Also, we express our sincere thanks to Dr. O. P. Kashyap, Dean Agriculture, Dr. A. K. Sarawgi, Head, Plant Breeding, , Dr. S. S. Shaw, Professor of Entomology, Dr. J. S. Urkurkar, Professor of Agronomy, Dr. V. K. Dubey, Prof. & Head, Dept of Entomology, Dr. Narendra Pandey, Prof. & Head, Dept of Agronomy, Dr. A. S. Kotasthane, Prof. & Head, Dept of Plant Pathology, IGKV, Raipur , Dr. Pankaj Kaushal, Joint Director (Research), ICAR-NIBSM, Raipur and Dr. Dineshkumar, Principal Scientist, ICAR, New Delhi and Dr. B. Boraiah, Associate Professor of Agronomy & Ex-PI (Agronomy) , UAS, Bengaluru for chairing various technical sessions and guiding the group in finalizing the technical programmes of various disciplines for the year 2018-19.

We profusely thank all the invited speakers for delivering lecture on key topics and sharing their experiences with the participants. Thanks are also due to all the rapporteurs of different sessions who recorded the proceedings meticulously. We also thank scientists of ICAR-IIMR, Hyderabad, Dr. Shobha Sija of ICRISAT, Hyderabad and all the representatives of private companies for their help and active participation in the meeting. We also thank all the Chairpersons and members of various committees of IGKV, Raipur, who helped in organizing the group meeting and made the stay of participants comfortable. We whole heartedly extend warm thanks to Host University, the whole team of SGCARS, IGKV, Jagdalpur for their untiring support in conducting the 29th AGM of AICRP on Small millets at IGKV Raipur, Chattisgarh and also thank all scientist delegates for successful conduct of meeting.

The significant contributions of all the Principal Investigators of the AICRP on Small Millets namely Dr. CR Ravishankar, Dr. TS Sukanya, Dr. TSSK Patro and Dr. Prabhu C. Ganiger and my scientist colleagues Dr. KB Palanna, Dr. TV Krishna and Dr. KS Shubhashree are thankfully acknowledged. All the technical, Administrative, supporting and contractual staffs of Project Coordinating Unit, AICRP on Small Millets have contributed significantly on various capacities throughout the year. Contribution of each and every one of them is thankfully acknowledged. A special note of thanks is due to Mrs. Sujata Bhat and C. Nandini, Sr. Technical Assistants, Mr. Kiran and A. Manjunath, Research Associates, Shri A Thippeswamy, Sr. Research Fellow who contributed immensely in data compilation and analysis and Mrs. Hemalatha and E. Netravati for their support in organizing the workshop.

27th April 2018
ICAR-AICRP on Small Millets
GKVK, Bengaluru-560005

Dr. Prabhakar
Project Coordinator (Small Millets)

Annexure-III



29th Annual Group Meeting of All India Coordinated Research Project on Small Millets

Date: 12-13, April, 2018

Venue: Indira Gandhi Krishi Vishwavidyalaya, Raipur

Agenda

Day 1: April 12, 2018 (Thursday)

9.00-9.45	:	Registration
10.00-11.15	:	Session - I: Inaugural session
		Chief Guest Shri Sunil Kumar Kujur, IAS, Agriculture Production Commissioner, Govt of Chattisgarh
		Chairman Dr. SK Patil Vice Chancellor, IGKV, Raipur
		Guests of Honour Dr IS Solanki, ADG (F & FC), ICAR, New Delhi
		Welcome Dr. SS Rao, Director of Research Services, IGKV, Raipur
		Highlights of Research in Small Millets: 2017-18 Dr. Prabhakar, Project Coordinator (Small Millets)
		Release of Publications By dignitaries
		Remarks by Guest of Honour Dr IS Solanki, ADG (F &FC), ICAR, New Delhi
		Remarks by Chief Guest Shri Sunil Kumar Kujur, IAS, Agriculture Production Commissioner, Govt of Chattisgarh
		Remarks by Chairman Dr. SK Patil Vice Chancellor, IGKV, Raipur
		Vote of Thanks Dr. O. P. Kashyap, Dean, College of Agriculture, IGKV, Raipur

	Rapporteurs	Drs. Ram Nigade and Laxmi Rawat		
11.15-11.30	:	Tea break		
11:45-12:45	:	Session – II: Presentation of progress report 2017-18 Each presentation shall not exceed 10 minutes ; Handouts to be circulated in advance		
		Chairman	Dr IS Solanki, ADG (F & FC) ICAR, New Delhi	
		Co-chairman	Dr. SS Rao, Director of Research Services, IGKV, Raipur Dr. Prabhakar, Project Coordinator (SM)	
		Rapporteurs	Drs. Sunil Karad and Dinesh Joshi	
		Plant Breeding	Dr. CR Ravishankar	
		Seed production	Dr. TV Krishna	
		Agronomy	Dr. TS Sukanya	
		Plant Pathology	Dr. TSSK Patro	
		Entomology	Dr. Prabhu C. Ganiger	
		Frontline demonstrations	Dr. TS Sukanya	
		Tribal Sub Plan & NEH	Dr. KB Palanna	
		Discussions & recommendations		
12:45-13:30		Session – III: Review of research: Scientific audit based on presentations of AICRP centres during 2017-18 (One consolidated presentation by centre In-charges as per template provided; each presentation shall not exceed 10 minutes; handouts to be circulated in advance)		
		Chairman	Dr. Pankaj Kaushal, Joint Director (Research), ICAR-NIBSM, Raipur	
		Co-chairman	Dr. Dineshkumar, PS, ICAR, New Delhi Dr. Prabhakar, Project Coordinator (SM)	
		Rapporteurs	Drs. Dr. K.B.Palanna and N. Anuradha	
		Athyandal, Mandya, Nandyal, Vizianagaram, Jagdalpur		
13.30-14.30		Lunch Break		
14.30-15.45		Session – III: Review of research: Scientific audit based on presentations of AICRP centres during 2017-18 (Continued)		
		Waghai, Ranichauri, Berhampur, Dholi, Ranchi, Rewa, Dindori, Kolhapur		
15.45-16.00		Tea Break		
16.00-17.30	:	Session - IV: Discipline-wise programme planning group meetings and finalization of technical programmes (concurrent sessions)		
		Discipline	Chairman	Convenor
		Plant Breeding	Head of Department	Dr. CR Ravishankar
				Place Dr. AK Sarawgi, Prof. & Head, Department of

		Plant Breeding & Genetics		Plant Breeding & Genetics
	Agronomy & FLD	Head of Department Agronomy	Dr. TS Sukanya	Dr. J. S. Urkurkar, Professor of Agronomy, Dept of Agronomy Dr. Narendra Pandey, Prof. & Head, Department of Agronomy Dr. B. Boraiah, Ex-PI (Agronomy), UAS-B
	Plant Pathology	Head of Department Plant Pathology	Dr. TSSK Patro	Dr. AS Kotasthane, Prof. & Head, Department of Plant Pathology
	Entomology	Head of Department Entomology	Dr. Prabhu C. Ganiger	Dr. S. S. Shaw, Professor of Entomology, Dept of Entomology Dr, VK Dubey, Prof. & Head, Department of Entomology
18.00-19.00	Session – V: Varietal Identification Committee meeting <i>(restricted to committee members only)</i> Identification proposals (15 copies) should be submitted to PC a fortnight in advance			
19.30-21.00	Dinner			

Day 2: April 13, 2018 (Friday)

09:00-12.30	:	Session –VI: Presentation of lead topics		
		Chairman	Dr. Dineshkumar, PS, ICAR, New Delhi	
		Co-chairman	Dr. Prabhakar, Project Coordinator (SM)	
		Rapporteurs	Drs. Anuradha and H. Ravindra	
		DUS characterization in small millets and Importance in AICRP trials	Dr. Hari Prasanna, Principal Scientist, ICAR-IIMR, Hyderabad.	
		Procedure for conservation of germplasm, released varieties and registered germplasm at ICAR-NBPGR	Dr. Sushil Pandey, Principal Scientist, ICAR-NBPGR, New Delhi.	
		Status of millet genetic resources management	Dr. M Elangovan, Principal Scientist, ICAR-IIMR, Hyderabad	
		Disease management in Small Millet crops	Dr. AK Jain, Professor (Plant Pathology) College of Agriculture, JNKVV, Rewa	
		Discussions & recommendations		
12:30-13.30		Session – VII: Open Session Interaction with Officer In-charge's/Scientists on administrative and financial matters		
		Chairman	Dr. Prabhakar, Project Coordinator (SM)	

		Rapporteur	Drs. A Nirmala Kumari and Prabhu Ganiger
13:30-14:30	:	Lunch Break	
14:30-16.00		Session – VIII: Plenary session (Presentation of session-wise recommendation and technical programme of work)	
		Chairman	Dr. IS Solanki, ADG (F & FC), ICAR.
		Co-chairman	Dr. SS Rao, Director of Research Services, Raipur
			Dr. Prabhakar, Project Coordinators (SM)
		Rapporteurs	Drs. LN Yogeesh and Krishna TV
		Plant Breeding	Dr. CR Ravishankar
		Agronomy	Dr. TS Sukanya
		Plant Pathology	Dr. TSSK Patro
		Entomology	Dr. Prabhu Ganiger
		Frontline demonstrations	Dr. TS Sukanya
		VIC proceedings	Dr. Prabhakar
		Best centre awards	Dr. Prabhakar
		Felicitations to retiring AICRP scientists	Drs Abhinav Sao and Prabhu Ganiger
		Co-chairman's remarks	Dr. IS Solanki, ADG (F & FC), ICAR. Dr. SS Rao, DRS, IGKV, Raipur
		Chairman's remarks	Dr. IS Solanki, ADG (F & FC), ICAR.
		Vote of thanks	Dr. Prabhakar, Project Coordinators (SM) Drs Abhinav Sao, Breeder, IGKV, Raipur
16.00-16.15	:	Tea Break and Conclusion of 29th AGM	



Participants in 29th Annual Group Meeting of AICRP on Small Millets

Location: Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chattisgarh

Dates: April 12-13, 2018

AICRP Centres

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59	Shri. LR Buldok, Joint Director
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Special Invitees

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List of Officers and Professors from Host University – IGKV, Raipur, Chattisgarh

61	Dr. SS Rao, Director of Research Services
62	Dr. GK Nirmam, Registrar
63	Dr. MP Thakur, Director of Extension Services
64	Dr. GK Shrivastava, Director of Student Welfare
65	Dr. Ravi R Saxena, Associate Director of Research
66	Dr. Rajendra Lakpale, Associate Director of Research
67	Dr. Vivek Kumar Tripathi, Associate Director of Research
68	Dr. SS Shaw, Director of Instructions
69	Dr. Abhinav Sao, Breeder, Dept of Plant Breeding
70-80	All Head/s of Departments/Schemes of Host University