

All India Coordinated Research Project on Small Millets, ICAR, GKVK, Bangalore-560065

Matter for DARE Annual Report 2016-17

Genetic Resources

- About 10183 germplasm lines of six small millet crops are being maintained at NAGS and 666 germplasm lines were supplied to needy centers.

Crop Improvement

Details of varieties released and notified in 2016-17

Finger Millet	ARJUNA(OEB-526)	Odisha, Bihar, Chattishgarh, Karnatak, Tamil Nadu	Medium maturity (106 days), semi compact ear head, light brown grain colour, moderately resistant to leaf, neck and finger blast diseases. Produces an average grain yield of 26.00 quintals per hectare and the potential yield is as high as 51.36 q/ha.
	GNN-6	Gujarat	Grain yield of 2800 kg/ha, Medium maturing, Reddish Brown colour seed, Moderately resistant to leaf blast and finger blast
	GN-5	Gujarat	Grain yield of 2500 kg/ha, Late maturing, White colour seed, Moderately resistant to leaf and finger blast.
	VL Mandua 348	Uttarakhand Hills	Suitable for organic cultivation; average yield: 18-20 q/ha under organic conditions; Maturity: 104-112 days; resistant to neck and finger blast; dwarf in stature (87 cm) and tolerant to lodging; light copper grains.
Kodo Millet	Jawahar Kodo 137	Rainfed areas of Madhya Pradesh	Grain yield -25.8 q/ha and fodder yield-4.27 t/ha. Erect, medium maturing, brown medium bold seed, suitable for sole as well as inter/mixed cropping, responsive to NPK, resistant to drought, lodging, and key pest Shoot fly and moderately resistant to head smut
Little millet	Chhattisgarh Kutki-2 (BL-4)	Chhattisgarh	Variety maturing in 90 to 95 days with a yield of 10 to 12 q/ha. It has high iron content (28.3 mg/100 g grain). Tolerant to major pests.
	GV-2	Gujarat	Grain yield of 2600 kg/ha, Medium maturing, Clean White colour and bold seeded, Resistant to pest and diseases.
	Phule Ekadashi (KOPL 83)	Sub-montane and Ghat Zone of Maharashtra	Higher grain yield (12.62 q/ ha). Late duration (120 – 130 days maturity), mid dwarf plant type with non- lodging characteristic. The panicle is drooping, long length and having complete panicle exertion.
	JawaharKutki 4 (JK 4)	Rainfed areas of Madhya Pradesh	Grain yield -13.08 q/ha and fodder yield-4.47 t/ha. Erect, early maturing, creamy medium seed, suitable for sole as well as inter/mixed

			cropping, responsive to NPK, resistant to drought, lodging, and key pest Shoot fly and moderately resistant to head smut
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- All the centres have produced targeted quantity of breeder seed in addition, and many centers produced breeder seeds of non-allotted varieties. A total of 257.28q of breeder seed was produced against the allocation of 58.74q.
- DUS guidelines of finger millet and foxtail millet are finalized and published in PPV & FRA official web site.

Crop Management

- Application of recommended dose of FYM (7.5 t /ha) and 75 per cent RDF along with treating seeds with bio-fertilizers (*Azospirillum brasilense* + *Bacillus magatherium* + *Psuedomonas fluorescence* is a better practice for higher productivity at Kolhapur region.
- Transplanting of pigeon pea with 40-45 day old seedlings raised in polybags as an inter crop in finger millet in 2:8 row ratio is remunerative practice in Bastar region of Chattisgarh
- Intercropping of foxtail + castor in 5:1 or 8:1 ratio is recommended for black cotton soils of Andhra Pradesh
- In skeletal soils of Dindori region (Madhya Pradesh), Kodo/ little + pigeonpea inter cropping (2 to 4:1) was a remunerative system
- Foxtail millet – chickpea crop sequence is remunerative in black cotton soils instead single crop or keeping the land fallow during *kharif* in Nandyal region of AP.
- Little millet followed by horsegram is remunerative cropping sequence in Chattisgarh state.
- Finger millet and Barnyard millet are better choices among small millets under saline sodic soils
- Mechanized harvesting of finger millet through Shracchi make TR 120 engine reaper is found to be cost effective and time saving.
- Soil application of *Trichoderma viride* @ 2.5 kg/ha. Either individually or in combination with *Pseudomonas fluorescens* (each @ 1.25 kg/ha) mixed with 60-65 kg compost, incubated for 10 days and applied at the time of first inter cultivation or hand weeding (25 to 30 days) to manage foot rot of finger millet growing states.
- Seed treatment with talc formulated P.fluorescens @ 10 g/kg is ideal for the control of sheath rot of kodo millet caused by *Sarocladium oryzae*
- Seed treatment with Validamycin @ 0.1% or Hexaconazole @ 0.2% and one need based spray with either of the chemicals control banded sheath blight of kodo millet caused y *R. solani*.
- Seed treatment with Hexaconazole @ 0.2% or Validamycin 0.1% controls banded sheath blight of little millet caused by *R. solani*
- Little millet cultures RLM 224, OLM 203, TNAU 176, 178 and RLM 4-1 have stable resistance for banded blight
- Kodo millet lines RPS 594, RPS 630, KOPKN 8, 14, 20 and JK 13 were having stable resistance to sheath blight.

Technology Assessment, Refinement and Transfer

Frontline demonstrations in Small Millets

Break up of demonstrations conducted based on area for different crops was Finger millet 100 ha, Foxtail millet 60 ha, Kodo millet 55, little millet 62 ha, Barnyard millet 13 ha and proso millet 10 ha. The total

number of farmers involved was 1180. Number of front line demonstrations conducted in small millets in different states indicated that there were 530 farmers involved in finger millet demonstrations during 2015 across the country followed by barnyard millet (221), little millet (163), Kodo millet (142), foxtail millet (113) and proso millet (11). The main purpose of this activity was to demonstrate the yield potential that could be attained by adopting the improved cultivation practices. Most of the demonstrations were conducted by adopting the whole package with improved varieties versus farmer's practices with local varieties. However, at Nandyal promising intercropping (Foxtail millet + Pigeon pea) and sequence cropping system (Foxtail millet - Mustard / Jowar/ Ground nut/ Paddy / Bengal gram) were demonstrated

Productivity of finger millet in front line demonstrations : The increased yield obtained from the improved varieties with whole package demonstrations was compared with farmer's practice in Karnataka, Tamil Nadu, Maharashtra, Jharkhand, Odisha, Andhra Pradesh, Chhattisgarh, Gujarat and Uttarakhand. In general, the grain yield ranged from 770 to 3500 kg / ha in rainfed / irrigated conditions respectively under improved crop management practice as against 530 to 3000 kg per hectare under farmers practice with local varieties.

Productivity of Foxtail millet in front line demonstrations: The front line demonstrations were conducted on foxtail millet in two states namely Andhra Pradesh and Karnataka with the improved varieties such as Suryanandi, Srilakshmi and SiA-3085 were evaluated. In Andhra Pradesh improved variety with recommended package of practice (recommended dose of fertilizer-40:20 kg NP₂O₅ /ha) gave an increase in yield (14) over farmer's practice (local variety) whereas, improved inter cropping and sequence cropping systems gave 27 and 47 per cent higher foxtail millet grain equivalent yield, respectively as compared to farmers practice. In Karnataka due to the introduction of HYV's at Hosadurga, Badami and Shiiggao taluks with whole package (improved varieties and compost / recommended dose of fertilizer) there was an improvement in foxtail millet grain yield to the tune of 33 - 265 per cent over farmer's practice.

Productivity of Kodo millet in front line demonstrations

The front line demonstrations were conducted in four states viz., Madhya Pradesh, Chhattisgarh, Karnataka and Tamil Nadu. Improved varieties of kodo millet viz. RBK 155, CO 3, JK 439, JK 98 and RK 137 were evaluated along with recommended dose of fertilizer (40:20 kg NP₂O₅ /ha) v/s farmers practice (local variety) which gave an increase in yield of 67 to 101 per cent in Madhya Pradesh, whereas, the increase in improved practice (improved variety and recommended dose of fertilizer / compost) over farmers practice was 87 per cent in Jagdalpur, 26 per cent in Karnataka and 18 per cent in Athiyandal of Tamil Nadu state.

Productivity of Little millet in front line demonstrations : The front line demonstrations of little millet were conducted in Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra, Madhya Pradesh, Chhattisgarh and Gujarat states, where in improved varieties viz. JK 8, JK 36, CO (SA) 4, GV 2 with recommended dose of fertilizer (40:20 kg NP₂O₅ /ha) were evaluated against local practices. The results presented in the Table 5 revealed that, the grain yield increase in demonstrations was 16 per cent in Tamil Nadu, 38 per cent in Karnataka, 36 in Andhra Pradesh, 42 per cent in Gujarat, 130 per cent in Chhattisgarh, 42 per cent in Maharashtra and 52-83 per cent in Madhya Pradesh due to introduction of improved varieties with entire package of practices over local practices.

Productivity of Proso millet in front line demonstrations :The front line demonstrations on proso millet were conducted in Tamil Nadu state with improved variety (CO (PV) 5) along with recommended dose of fertilizer (40:20 kg NP₂O₅ / ha) V/s farmer's practice. The improved variety along with improved management practice gave 18 per cent higher grain yield (1308 kg/ha) as compared to farmers practice (1105 kg/ha).

Productivity of Barnyard millet in front line demonstrations: The front line demonstrations on barnyard millet were conducted in Uttarakhand (Almora and Ranichauri) and Tamil Nadu with improved varieties viz. PRJ 1, VL 207, VL 172 and CO 2 and whole package (improved variety and recommended dose of fertilizer- 40:20 kg NP₂O₅ / ha) V/s farmer's practice. In the mid hills of Uttarakhand (Ranichauri and Uttara Kashi) the improved / whole package demonstrations gave 1539 kg/ha mean grain yield which was 50 per cent higher than farmer's practice (1026 kg/ha) where as at Almora whole package demonstration gave mean grain yield of 753 kg/ha. In Tamil Nadu the whole package demonstration, the mean yield of 1371 kg / ha was obtained which was 28 per cent higher than farmer's practice (1071 kg / ha). The physical locations of these demonstrations in different states are given in the table 8 to 8.5.

Research for Tribal and Hill Regions

Improving the livelihood of Tribal farmers by encouraging small millets cultivation and consumption

During the year 2015-16, the TSP programme was carried out in five centres viz., Dindori, Jagdalpur, Mandya, Vizianagaram, and PC Unit (Small millets), Bengaluru (Palakkad, Kerala) and an amount of Rs.31.40 lakhs was released to different centres and an area of 410.3 ha were covered under finger millet. In all about 1401 farmers of 74 villages were beneficiaries of the programme. Improved varieties of finger millet along with organic fertilizers (vermi-compost) and weedicide were distributed to tribals. Some needy farm implements like seed cum fertilizer drill, inter-cultivator sickles and sieves and sprayers were also distributed to farmers. During the cropping season, 21 training programmes, 3 field days and one and millet festival were organized.

Impact: The programme resulted in introduction of finger millet in tribal populations for cultivation and also consumption. The fodder of the finger millet was used by tribals for feeding the cattle's with no extra cost. The training and field demonstrations helped in a systematic improvement of knowledge on the cultivation aspects of the crop.

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