

Matter for DARE Annual Report 2017-18

Genetic Resources

- About 10183 germplasm lines of six small millet crops are being maintained at NAGS and 1266 germplasm lines were supplied to needy centers.

Crop Improvement

Details of varieties released and notified after August 2016 to August 2017

Varieties identified

Crop	Variety	Area of adaptation	Salient features
Finger millet	VL Mandua 379	North Zone	High yielding variety with resistance to neck and finger blast and moderately resistant to banded blight in Madhya Pradesh. Tolerant to ear head caterpillar incidence. Average yield: 31-35 q/ha Maturity: 107-109 days.
Proso millet	TNPm 230	Bihar, Karnataka, Tamil Nadu	Early maturing high yielding variety. Showed higher incidence of shoot fly. Average yield: 21-23 q/ha Maturity: 72-74 days.
Little millet	DHLM-14-1	All India	High yielding variety with tolerance to shoot fly. Recommended for All India except in Andhra Pradesh, Bihar, Madhya Pradesh, Chattisgarh & Jharkhand as it is susceptible to banded sheath blight. Average yield: 16-18 q/ha Maturity: 94-102 days.

Varieties released and notified

Crop	Variety	Area of adaptation	Salient features
Finger Millet	KMR 340	Karnataka	White ragi variety, especially for confectionary purpose, resistant to blast and blight diseases, tolerant to stem borer and aphids. Average yield: 35-40 q/ha Maturity: 90-95 days.

	Dapoli-2 (SCN-6)	Konkan region of Maharashtra	A tissue cultured, somaclonally developed finger millet high yielding variety rich in iron and calcium. Moderately resistant to blast. Tolerant to aphids and <i>Spodoptera littura</i> . Average yield: 25-27q/ha Maturity: 118-120 days.
	CO 15	Tamilnadu	Highly responsive to nitrogenous fertilizer, non lodging, resistant to leaf, neck and finger blasts and nutritionally rich grain and fodder. Variety possesses consumer preferred bold and copper red grains. Average yield: 29.0 q/ha under rainfed and 34.0 q/ha under Irrigated. , Maturity: 115-120 days
	GNN 7	Gujarat	Very good nutrition properties high mineral matter (%) crude fibre, Calcium, Phosphorous and good amount of protein, fat, carbohydrates and magnesium. Average yield: 25.0 q/ha, Maturity: 123-128 days
	VL 376	All Ragi growing areas of country	Responsive to fertilizer and moderately resistant to blast. Average yield: 29-31q/ha, Maturity: 103-109 days
Kodo Millet	TNAU-86	National	Early duration, non-lodging, milling recovery (52-53%) Average yield: 27-30q/ha, Maturity: 95-110 days
Proso millet	TNAU 202	National	Profuse tillering and bold grains Average yield: 18-20 q/ha, Maturity: 70-75 days
Foxtail millet	RAU (Rajendra Kauni 1-2)	Irrigated and Rainfed upland of Bihar	Resistance against leaf blast, rust, smut, brown spot, downy mildew and leaf blight. High iron content of 15.45 (mg/100g) and Zinc (5.02 mg/100g). Average yield: 23-25q/ha, Maturity: 80-83 days
Little millet	BL 6	National	Recommended for upland cultivation, and rich in zinc and calcium Average yield: 12-14q/ha, Maturity: 90-95 days

- 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 on trial basis for 2016-17.
- DUS guidelines for all the small millet crops, viz. Finger millet, Foxtail millet, Barnyard millet, Little millet, Kodo millet and Proso millet are finalized and published in PPV & FRA official web site.

Seed production

- All the centres have produced targeted quantity of breeder seed in addition, and many centers produced breeder seeds of non-allotted varieties. An indent of 25.58 quintals of breeder seed was made by DAC, Government of India for all the six crops of small millets. Accordingly, the total production of breeder seed was 105.90 q against indent of 25.58 q and it is 206.99 % more than the allocation in 2016-17. A surplus breeder seed of 80.32q has been produced.

Crop Management

- Evaluation of pre- released genotypes to fertility levels indicated that 100 per cent recommended dose of fertilizer was optimum to get higher yields in Finger millet, Foxtail millet and Proso millet, whereas 125 per cent RDF for Little millet.
- Test varieties of VL 379 (Finger millet), BL 150 (little millet), SiA 3163 (Foxtail millet) and TNPM 228 (Proso millet) were superior to local or national checks which gave 24.16 %, 49.49 %, 15.23 % and 28.13 % increase in grain yield respectively.
- Nutrient management in small millets showed that seed treatment with biofertilizer and micro nutrients along with RDF application was superior to raise the Finger millet production both under rainfed and irrigated condition. Inclusion of sunhemp as green manure in rice fallows and 75% RDF enhanced the productivity and profitability of succeeding finger millet in irrigated condition.
- Kodo millet/little millet based inter cropping system (Kodo /little millet + Pigeon pea 8:2) was the most profitable system in Dindori, Rewa and Athiyandal.
- Need based agronomic management practices are necessary to tackle mid and late season drought to increase yield level and for moisture conservation in assessing the performance of small millets to different sowing windows.
- Cultural practices like two inter cultivation along with one hand weeding improve the yield level in finger millet, kodo millet and little millet crops.
- Summer ploughing was a best practice for moisture conservation under rainfed conditions for cultivation of minor millets.
- Application of zinc either through soil or foliar application did not result in significant increase in grain yield

Pathology

- In the eco-friendly management of banded/ sheath blight over locations and amongst different small millets, soil application of value added *P.f.+T.v.+B.s.* not only minimized disease, but also enhanced grain and fodder yields.
- Head blast pressure was low to moderate in Andhra Pradesh, Chattisgarh, Karnataka, Odisha and Tamil Nadu, whereas high blast prevailed on local varieties in Jharkhand and Uttarakhand.
- Brown spot and foot rot were low to moderate in Odisha and Tamil Nadu while cercospora leaf spot remained high in Uttarakhand. On foxtail millet, blast, rust and downy mildew occurrence was low in Andhra Pradesh, whereas in Uttarakhand grain smut was low to high, but sheath blight was low on barnyard millet.
- In little millet, grain smut and banded blight ranged from low to high; in kodo millet head smut, banded blight and *Striga* occurrence was of low to moderate intensity in Madhya Pradesh.
- Among the germplasm, finger millet line VR-13-14 was immune to both neck and finger blasts at Almora, whereas at Mandya varieties GN 4, GN 5 and Dapoli 1 were not only immune to head blast, but were highly resistant to foot rot. At Almora ten IEC lines of barnyard millet were immune to grain smut.
- In finger millet, BR 14-3 for blast and PR 10-35 for banded blight were highly promising, whereas

CLS, VL 379 showed moderate resistance to neck blast. Five little millet varieties KOPLM 53, GPUL 2, WV 126, DLM 95 and DHLT 28-4 were free from grain smut; kodo millet variety DPS 118 was highly resistant to head smut whereas Barnyard millet variety DHBM 18-6 was resistant to grain smut. Foxtail millet varieties SiA 3164 for brown spot and rust, DHFT 5-6 for rust and blast, H-4-6 for rust and downy mildew were resistant.

Entomology

- In finger millet, the grasshopper is a major biotic constraint followed by the Pink stem borer, Aphids (leaf aphid and panicle aphid), *Mylocerus* weevil and ear head caterpillar.
- Shoot fly was the major pest on other millets (viz., kodo, little, proso, foxtail and barnyard millet) at four different centres.
- In management of shoot fly in Little millet, the highest yield 804 kg/ha was recorded in treatment spraying of 1500 ppm azadirachtin at 15 DAS followed by 796 kg/ha in NSKE 5 % at 15 DAS, 1.5 times recommended seed rate (734 kg/ha) and sprayed with NSKE 5 % at 7 DAS (703 kg/ha) treatments are significantly different from control.
- For Proso millet, highest yield 385 kg/ha was recorded in treatment spraying of 1500 ppm azadirachtin at 15 DAS followed by 370 kg/ha in NSKE 5 % at 15 DAS, 1500 ppm azadirachtin at 25 DAS (358.6 kg/ha), early sowing (7 days before normal sowing) (334.4 kg/ha) and 1.5 times recommended seed rate (325.9 %) treatments are significantly differ compared to control.

Technology Assessment, Refinement and Transfer

Frontline demonstrations in Small Millets

Front Line Demonstrations were conducted during 2017 in the states of Andhra Pradesh, Karnataka, Tamil Nadu, Chattisgarh, Jharkhand, Maharashtra, Madhya Pradesh, Uttarakhand and Gujarath on farmer's fields. The total area under Front Line Demonstrations was 300 ha of which 115 ha was in finger millet, 45 ha in kodo millet, 50 ha in foxtail millet, 60 ha in little millet, 20 ha in barnyard millet and 10 ha in proso millet. The total number of farmers involved was 1066.

Number of front line demonstrations conducted in small millets in different states indicated that there were 438 farmers involved in finger millet demonstrations during 2016 across the country followed by proso millet (293), Kodo millet (154), foxtail millet (90), little millet (77), and barnyard millet (14). The main purpose of this activity was to demonstrate the yield potential that could be attained by adopting the improved cultivation practices.

- The demonstrated varieties of finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet gave 52.63 %, 81.19%, 17.31 %, 169.50%, 110%, 136.34%, 77.36%, 83.61%, 29.14%, 33%, 41.57% and 13.68% higher grain and fodder yields respectively than the local checks.
- The demonstrated varieties of finger millet under FLDs yielded (52.63 per cent increase) grains and 81.19 per cent more fodder than the local check. In results, an incremental benefit-cost (B: C) ratio of 1.94 was obtained from them compared to the local check.
- The data on grain and fodder yields obtained from demonstrated varieties of Foxtail millet under FLDs which were organized by Athiyandal, Hagari, Hanumanamti and Nandyal indicated that yielded 17.31 per cent more grains and 169.50 per cent more fodder with B: C ratio of 2.75 compared to the local varieties.
- Demonstrated varieties of Kodo millet performed better in terms of grain (110 %) and fodder yield (136.34 %) under FLD which were more B: C ratio (2.13) compared to farmers practice.
- The data on grain and fodder yields of little millet obtained from demonstrated varieties under FLDs yielded 77.36 per cent more grains with B: C ratio of 1.90. It shows that the demonstrated

varieties were also good as per the fodder yield is concerned compared to the local varieties.

- Performance of demonstrated varieties of Barnyard millet in the Athiyandal, Almora and Ranichauri was found better and gave 29.14 per cent higher grain and 33 per cent fodder yield than the local check. An additional net return of 40,997/- per ha was obtained from improved practices which was 102 per cent more than the local check
- In Athiyandal area of Tamilnadu, CO 5 variety of Proso millet performed better and gave 41.57 per cent higher grain yield and 13.68 per cent fodder yield than the local check. It was resulted in to 40.78 per cent additional net return (Rs.30946/- per ha) than the local check (Rs,21981/ha)

Impact of the frontline demonstrations

- The results revealed that the grain yield of finger millet (1367 kg/ha), foxtail millet (1682 kg/ha), kodo millet (594 kg/ha), little millet (543), barnyard millet (1140) and proso millet (712) was lower under local practice as compared to FLDs (2087, 1974, 1251,963, 1472 and 1008 kg/ha, respectively) indicating wide gap of 52.63, 17.31, 110, 77.36, 29.14 and 41.57 per cent respectively, across the states.
- The net returns obtained under FLDs was Rs.50320, 38650, 30438, 30685, 40997 and 30947 per ha, of finger millet, foxtail millet, kodo millet, little millet, barnyard millet and proso millet respectively. The increase in benefit-cost ratio obtained from the FLD cultivars was 0.55. Per cent yield gap in small millets were worked out and 52.64 per cent yield gap was found in finger millet and 110.70 per cent found in kodo millet.

Research for Tribal and Hill Regions

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

Tribal Sub Plan:

- 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 six centres viz., Jagdalpur, Athiyandal, Dindori, Mandya, Vizianagaram and P.C unit (Palakkad, Kerala) and the amount of Rs. 29.50 lakhs was released to different centres during the year 2016-17.
- At Mandya, there was 45 % improvement in yield in farmer's fields with improved practice as compared to local practice in finger millet..
- At Dindori, the demonstrations in farmers field in 20.0 ha area in kodo millet indicated that there was an increase of 89.72% in improved practice over farmers practice. Demonstrations in farmers field in 10.0 ha area in little millet indicated that there was an increase of 102.16% increase in grain yield in improved practice over farmers practice.
- At Vizianagaram, the demonstrations in farmer's field in finger millet indicated that there was an increase of 79.30% increase in grain yield in improved practice against farmers practice.

Popularization of small millets in NEH Region

- As of now, few varieties of millets are sporadically grown by the tribal farmers and consumed in parts of Assam and adjoining the North-Eastern states in limited quantity. The popularization of small millets in this region is important to uplift the economic level of the farmers.
- A total of Rs. 31.08 lakhs has been allocated three centres, viz. Gossaigaon in Assam, Agartala in Tripura and Namthung, Sikkim to popularise the small millets in NEH region by way of conducting demonstration in farmer's fields in summer and kharif 2017.
- Besides, implements like thresher and de-husker have been provided to all the three centres.
- 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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