seed weight. The F_2 populations of CO 5 x ICPL 332 and VRG 17 x ICPL 332 possessed higher GCV, heritability and genetic advance for yield *per se* and these populations will be of much use to improve seed yield per plant in future through pedigree breeding procedure.

References

Anonymous. (1999). Crop production guide. Department of agriculture, Government of Tamil Nadu. pp.73-78.

Anonymous.(2003). Agricultural Statistics. All India, area, production and yield of Tur (Arhar). **In**: Area, Production and yield of principal crops. Ministry of Agriculture, Govt. of India, New Delhi.

Empig, L.T., Lantican, R.M and Escuro, P.B..(1970). Heritability estimates of quantitative characters in Mung Bean (*Phaseolus aureus* Roxb.) *Crop Sci*., **10**: 240-241.

Deshmukh, R.B., Rodge, R.G., Patil J.V and Sahane, D.V. (2000). Genetic variability and character association in pigeonpea under different cropping systems. *J. Maharashtra Agl. Univ*., **25 (2**): 176 -178.

Mane, L.L., Magar, N.M and Kaledhonkar, D.P. (2003). Studies on variability, heritability, correlation and path analysis for grain yield and its components in pigeonpea. Natl. Seminar on Advances in Genetics and Plant Breeding : Impact of DNA Revolution (**Abstracts**), October 30-31,UAS, Dharward, pp.113.

Natarajan, C., Thiyagarajan, K., and Ayyamperumal. A. (1990). Genetic variability, correlation and path coefficient analysis in pigeonpea. *Madras Agrl. J*., **77**: 378-381.

Patel, K.N. and Patel. D.R. (1998). Studies on genetic variability in pigeonpea. *International Chickpea and Pigeonpea Newsl*., **5**: 28-30.

Venkateswarlu, O. (2001). Genetic variability in pigeonpea (*Cajanus cajan* (L.) Millsp.). *Legume Res*., **24 (3)**: 205-206.

Madras Agric. J., 95 (7-12) : 436-439 July-December 2008
https://doi.org/10.29321/MAJ.10.100609

Research Notes

Gamma ray induced variation for lodging resistance and its associated characters in littlemillet (*Panicum sumatrense* Rothex-Roem and Schult)

A.NIRMALAKUMARI, S. ARULSELVI, V. SUGUNA, N.SENTHIL AND J.SOUFRAMANIAN
Department of Millets, Tamil Nadu Agricultural University, Coimbatore – 3.

Being a self pollinated crop, the variability in littlemillet is less. Most of the released strains were evolved through mass selection or pureline selection methods. Breeding of new varieties by hybridization has not been very successful because of the difficulties encountered in the manipulation of the tiny spikelets on brittle pedicels. In view of the above situation, mutation breeding can complement the conventional breeding methods in the improvement of littlemillet. Inducing variability in the base population and applying selection

Table 1. Values of PCV, GCV, heritability (h^2) and genetic advance (GA) as per cent of mean in M_3 generation of littlemillet.

Characters	Tt (Gy)	CO3 Mean	CO3 PCV (%)	CO3 GCV (%)	CO3 h^2 (%)	CO3 GA (% of Mean)	CO (Samai)4 Mean	CO (Samai)4 PCV (%)	CO (Samai)4 GCV (%)	CO (Samai)4 h^2 (%)	CO (Samai)4 GA (% of Mean)
Plant height(cm)	300	127.11	14.13	14.01	98.41	28.64	119.84	12.84	12.73	98.32	26.00
	400	129.04	12.81	12.71	98.52	25.99	122.90	12.56	12.46	98.47	25.47
	500	129.02	10.05	9.92	97.43	20.16	119.38	10.30	10.18	97.68	20.73
	600	129.90	16.99	16.91	99.06	34.67	117.56	11.20	11.16	97.94	22.76
	700	128.72	29.08	29.02	99.62	59.67	106.83	31.72	31.68	99.71	65.16
Total no. of tillers	300	13.26	41.26	40.13	87.56	76.31	10.23	46.38	45.62	98.56	64.56
	400	17.27	39.48	38.57	84.26	59.64	11.26	51.23	50.23	95.61	62.38
	500	14.29	41.20	40.37	82.12	68.34	13.34	58.61	57.46	94.26	60.26
	600	15.27	40.12	39.67	84.31	61.23	12.68	49.64	46.35	93.68	72.39
	700	16.67	35.46	34.56	80.13	57.46	15.95	56.21	55.26	94.58	55.49
Number of nodes	300	4.17	14.56	14.02	56.08	45.56	4.70	10.23	9.03	26.32	51.32
	400	3.49	16.23	15.67	35.24	12.36	4.56	15.26	15.00	51.23	41.23
	500	4.57	15.27	14.56	51.26	18.26	5.26	21.15	19.26	25.26	61.28
	600	4.21	13.21	12.28	53.27	54.26	4.27	29.26	28.16	40.26	50.23
	700	4.56	12.26	11.29	24.59	19.68	4.23	31.26	30.26	24.57	44.59
Culm thickness(cm)	300	2.06	14.17	13.06	85.01	24.81	2.05	13.64	12.62	85.62	24.06
	400	2.00	15.17	14.36	89.66	28.01	2.12	16.82	15.86	88.89	30.80
	500	1.98	11.77	10.81	84.44	20.47	2.08	15.21	14.45	90.25	28.28
	600	2.00	15.21	13.93	83.82	26.26	2.02	15.56	14.80	90.46	28.98
	700	2.00	22.79	20.80	83.33	39.11	2.00	28.22	26.09	85.47	49.68
Internodal length(cm)	300	18.73	22.77	22.11	94.26	44.22	17.23	18.04	17.56	94.78	35.21
	400	18.00	16.85	16.30	93.53	32.47	17.26	16.38	16.18	97.58	32.92
	500	17.51	15.61	14.94	91.63	29.45	19.52	19.89	19.72	98.24	40.26
	600	14.87	17.50	16.61	90.02	32.46	18.78	20.26	20.14	98.74	41.21
	700	14.53	28.64	28.50	99.07	58.44	18.38	33.03	32.96	99.58	67.76
Grain yield per plant(g)	300	24.29	59.01	58.75	99.1 I	80.47	26.38	34.80	34.29	97.10	69.61
	400	22.14	36.77	36.27	97.30	73.69	27.68	36.02	35.68	98.12	72.80
	500	25.19	48.54	48.00	97.80	97.79	26.12	40.54	40.13	97.99	81.83
	600	24.08	36.42	36.33	99.50	74.65	24.35	37.93	37.53	97.89	76.48
	700	23.73	46.82	46.68	99.41	95.88	15.79	37.83	37.82	99.91	77.86
Lodging susceptibility	300	2.37	14.62	11.93	66.67	20.07	2.44	11.64	7.13	37.50	8.99
	400	2.48	11.40	8.06	50.00	11.75	2.43	1 1.60	6.20	28.57	6.83
	500	.2.44	10.84	7.10	42.86	9.57	2.28	10.79	4.41	16.67	3.70
	600	2.53	8.84	3.95	20.00	3.64	2.27	13.59	10.04	54.55	15.27
	700	2.58	10.25	6.71	42.86	9.05	2.11	11.61	4.74	16.67	3.99

on the variability so created is meant to provide wider scope for evolving new varieties with desirable attributes. Therefore, for enlarging the variability and for widening the scope for selection for non-lodging and high yielding varieties in littlemillet, induced mutagenesis has been resorted to expand variability followed by efficient selection. It would result in the evolution of improved genotypes.

Two high yielding littlemillet varieties from Tamil Nadu Agricultural University, Coimbatore *viz.*, CO3 and CO(Samai)4 were selected as the parent genotypes for the present mutation study during *kharif,* 2006 and *rabi.* 2006-2007. They were exposed to 300, 400, 500, 600 and 700 Gray of gamma rays from ^{60}Co source at BARC, Mumbai. For each treatment, 25 grams of seeds from two varieties were taken for irradiation. The treated seeds were sown in the field along with control (untreated seeds) in a Randomized Complete Block Design with two replications. In each treatment of both the varieties, the plants were harvested separately and the seeds gathered from each M_2 were used to raise M_3 generation in a plant progeny basis. The M_3 generation was raised from the seeds of the single M_2 plant with 2 replications. In M_3 generation 979 plants from different treatments were tagged individually and they were harvested and threshed separately. The observations on lodging and its associated characters *viz.*, plant height, total number of tillers per plant, number of nodes per culm, inter-nodal length, culm girth along with grain yield per plant were recorded. The mean of M_3 generation of different treatments were subjected to biometrical analysis (Johnson and Comstock, 1955).

Presence of genetic variability in the available population is the prerequisite for any crop improvement programme. The estimates of mean, phenotypic and genotypic co-efficients of variation (PCV and GCV), heritability and genetic advance as per cent of mean are given in Table 1 for M_3 populations of CO3 and CO(Samai)4 littlemillet varieties respectively. The genetic changes in the recorded characters could be realized with an increased variance in M_3 generations over corresponding check. The co-efficient of variation helps to measure the range of 'diversity available in the character with reference to its mean and provides a route to compare the variability present in the quantitative characters. In M_3 population, in all the five irradiated doses of both the varieties recorded high co-efficient of variability for total number of tillers and grain yield. Whereas the other characters showed low to medium variability in both the varieties. Moreover, plant height and inter-nodal length recorded PCV and GCV in equal magnitude in M_3 generation of both CO3 and CO(Samai)4 . This indicated the lesser influence of environmental factors on expression of the character in the corresponding population. Same results had been reported in littlemillet by Rao (1991L in foxtailmillet by Lakshmana and Guggari (2001), in fingermillet by Suryakumar (1995), in prosomillet by Prasad *et al.* (1995) and in kodomilletby Kandasamy *et al.* (1990).

The estimates of both heritability and genetic advance are helpful for making effective selection than the heritability estimates alone. The higher magnitude of heritability indicates that the genotype is inherited to the next generation and therefore selection based on phenotype will reflect the genotype. In M_3 generation, the heritability and genetic advance were higher for plant height, total number of tillers, internode length and grain yield for all the mutagenic treatments of

CO3 and CO(Samai) 4 and hence selection based on these characters would improve the variety. The increased heritability and genetic advance might be due to increased mutations and recombinations induced by mutagenic treatment. Therefore, these characters could be transmitted to further generations and a potential gain could be achieved through selection in all the families of both the varieties for improvement of .these characters. Similar results were earlier reported in littlemillet by Padmaja (1998) and in prosomillet by Nirmalakumari *et al.* (2006). The remaining characters showed low to medium heritability and genetic advance in M_3 generation of CO3 and CO(Samai)4.

With reference to lodging susceptibility, the maximum heritability and genetic advance were recorded in the progeny of M_3 generation of CO3 at 300Gy treatment. Selection for improving resistance to lodging could be made in these populations. The lodging resistance is closely associated with shorter plant height, thick culm and reduced internodal length. Accordingly, selection based on these characters along with lodging resistance in mutagenic dose at 300Gy was found to be effective in the improvement of CO3 variety in M_3 population for evolving a high yielding and non-lodging littlemillet variety.

References

Johnson, H.W. and Comstock, R.E. (1955). Genotypic and phenotypic correlation in soybeans and their implications in selections. *Agron. J.,* **47:** 477-483.

Kandasamy, G., Ramamoorthy, N. and Manoharan, V. (1990). Genetic variability in kodomillet. *Madras Agric. J.,* **77:** 9-12.

Lakshmana, D. and Guggari, A.K. (2001). Genetic variability studies in foxtailmillet. *Karnataka J. Agric. Sci.,* **14(2):** 311-314.

Nirmalakumari, A., Senthil, N., Selvi, B. and Raveendran, T.S. (2006). Evaluation of b-carotene content of prosomillet *(Panicum miliaceum* L.) in core germplasm and their association with yield. In: National Conference on Agrobiodiversity, February 12-15th 2006, National Biodiversity Authority, Chennai, pp. 249.

Padmaja. J. (1998). Studies on variability, correlation, path analysis and D^2 analysis for yield and yield attributes in littlemillet *(Panicum sumatrense* Roth.). M.Sc(Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Prasad, S.G., Nagaraja, T.E., Seetharam, A. and Gowda, B.T.S. (1995). Genetic variability and character association studies in prosomillet. *Crop Sci.,* **22(2):** 225-227.

Rao, S.S. (1991). Genetic variability in minor millets. *Indian J. Agric. Sci.,* **61:** 322-323.

Suryakumar, M. (1995). Phylogenetic studies through multivariate analysis in fingermillet genotypes. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.