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RESEARCH

EVALUATION OF M_3 MUTANT STOCK OF KODO MILLET (*PASPALUM SCROBICULATUM* L.) FOR ECONOMICALLY DESIRABLE PLANT TYPE

Kishor Kumar*, Bhavna Sinha, Khushboo Gupta, Prafull Kumar, R.R. Kanwar, Beena Singh and D.P. Singh

Department of Genetics and Plant Breeding, S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
Department of Horticulture, S. G. College of Agriculture and Research Station Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
Department of Agricultural Statistics and Social Science, S. G. College of Agriculture and Research Station Kumhrawand, Jagdalpur, Bastar 494001 (C.G.)
Email:prafull397@gmail.com

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Abstract: The current experiment study on induced mutation in kodomillet (*Paspalum scrobiculatum* L.) was carried out in *Kharif* 2023 at the Research cum Instructional Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.). Induced Percentage improvement in M_3 generation of mutant lines of kodomillet compared with check varieties Indira kodo-1.For the assessment of percentage improvement in mutant lines of kodomillet among 500 mutant lines evaluated, 110 mutant lines are best performed for number of grains per panicle, 111 mutant lines exhibited better improvement for grains weight per panicle and 110 mutant lines performed best for test weigth when compared to check variety (Indira kodo-1). The maximum improvement in the menifestation of yield was showed by number of grains per panicle followed by grains weight per panicle, test weight and length of raceme suggesting scope for improvement in these traits.

Keywords: Kodomillet, *Paspalum scrobiculatum*, Induced mutation, Gamma rays, Mutants

INTRODUCTION

Kodo millet (*Paspalum scrobiculatum* L.) is a tetraploid (2n=4x=40) small grained cereal which belongs to the family poaceae (gramineae) grown for its grain and fodder, is indigenous cereal of India. Among cultivated and wild spp. *Paspalum scrobiculatum var. scrobiculatum* is widely cultivated in india and other parts of the world as an important food crop, while *Paspalum scrobiculatum var. commersonii* is the wild spp. indigenous to india. 2023 was declared the "International Year of Millets" by the United Nations (UN) in an attempt to boost millet production and promote public knowledge of the crop. Kodomillet is one such crop which is a wonder cereal and is highly self-pollinated owing to its cleistogamous flower. It is an aggressive colonist of damaged environments. This cereal is referred to as Varaguin Tamil, Aruguin Telugu, Khoddi in Urdu, and Kodo in Hindi. Throughout most of its area in India, the species was probably once picked as a weed and then tamed (de Wet 1983).Kodomillet was grown in 2.35 lakhhectares during 2005-06 in states, like Madhya Pradesh, Maharashtra, Tamilnadu and Chattisgarhkodo millet is the second-most productive and acreage small millet in India, behind finger millet. About 72% of the total area used for kodo millet cultivation is shared by Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Tamil Nadu, Gujarat, Maharashtra, and Karnataka. (Yadava, 1997).All types of millets are abundant in calcium, iron, folic acid, niacin, potassium, magnesium, and zinc (Parvathy and Thayumanavan 1995). There are 9 grams of protein per 100 grams of grain, or 11% of the total protein content. Kodo millet is similar to other millets in that it has 353 kcal and 66.6 g of carbohydrates per 100 g of whole grain. High concentrations of polyphenols, an antioxidant substance, are also present in kodo millets. According to research on progeny analysis, later generations achieve homozygosity, which illustrates how features are inherited generally throughout generations (Banumathy*et al.*, 2017; Ananthi*et al.*, 2018).Among the breeding techniques used to create diversity is mutation and selection, which can help in the identification of better-performing mutants for future use.The results of the regression analysis suggest an important relationship between the M_4 and M_5 generations (Lalitha *et al.*,

*Corresponding Author

2018).Plant breeders could select the best parents for their breeding programs with the aid of information on the type and extent of genetic diversity(Vivekanandanand Subramanian, 1990). Gamma rays are a type of electromagnetic radiation that both stimulates and inhibits plant development. It is crucial to determine the gamma irradiation dose in order to cause the desired variation in plants (Patel *et al.*, 2017).

MATERIALS AND METHODS

The current experiment study on induced mutation in kodomillet was carried out in *Kharif* 2023 at the Research cum Instructional Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.), which was located at 19 5'35" N and 81°57'37" E, at an altitude of 552 meters in Bastar plateau above the main sea level.The500 mutant lines in kodomillet var. indira kodo-1was laid out as an Augmented Randomized Block design (ARBD) with 10 blocks with 3checkvarieties- Indira kodo-1, chhattisgarhkodo 2 (CGKodo 2) and chhattisgarhkodo 3 (CG Kodo 3)inagriculture field. Seeds were sown in each block in theprepared field condition. Standard cultural practices and management techniques were followed to grow the crop.At harvest stage, regular plantswere selected for determining the percentage improvement in mutant lines in kodomillet. At the harvest stage,plant height, flag leaf length, flag leaf width,length of raceme, productive tillers, numberofgrain per panicle, test weight and grain weight per panicle were all recorded on randomlyselected plants for each line in every block.Morphological mutant such regular panicle were examined and selection of agronomically desirable plant type for M_4generationwere estimated in the current study.

RESULTS AND DISCUSSION

There are two types of spikelet arrangements in kodomillet (regular and irregular types) based on raceme morphology.In the current experiment, morphological mutants such regular panicle were examined.Plants with regularly arranged spikeletsare also found in most kodomillet fields. The racemes of the most common kodomillet are characterized by two rows of spikelet's arranged on one side of a flattened rachis.Inducing mutations may be essential to modify crop plants in order to increase their yield and nutritional quality.These rays have a higher penetrating power than other ionizing radiation, which distinguishes the above other forms of radiation and explains for their wider use in improving various plant species.

Number of grains per panicle

Out of 500 mutant lines evaluated, when compared to check variety (Indira kodo-1), 113 mutant lines are best performed for number of grains per panicle mutant lines viz. 2022-180 (402.00) revealed improvement of about 74.48% over check variety Indira kodo-1 (230.40) contributed maximum toward followed by 2022-6 (391.00) revealed improvement of about 69.70%, 2022-143 (372.00)observed improvement of about 61.46%, 2022-180(368.00) revealed improvementof about 59.72%, 2022-297 (361.00) exhibited improvement of about 56.68%,2022-199 (358.00) revealed improvement of about 55.38%, 2022-189 (357.00)observed improvement of about 54.95%, 2022-69 (347.00) manifested improvementof about 50.61%,2022-190 (335.00) manifested improvement of about 45.40%,2022-228 (332.00) recorded improvement of about 44.09%, 2022-283 (330.00)observed improvement of about 43.22%, 2022-200 (328.00) recorded improvementof about 42.36% (Fig 1).100 mutant lines evaluated, when compared to Indira kodo-1 (check variety), 11 mutant linesperformed best for grain per panicle. BK2022-1 (61.92%) contributed maximum towards grain per panicle followed by BK2022-73 (18.59%), BK2022-12 (15.17%), BK2022-76 (14.03%), BK2022-68 (11.74%), BK2022-2 (10.03%), BK2022-92 (9.46%), BK2022-29 and BK2022-99 (5.47%), BK2022-6 (3.76%),(15.17%), BK2022-76 (14.03%), BK2022-68 (11.74%), BK2022-2 (10.03%),BK2022-92 (9.46%), BK2022-29 and BK2022-99 (5.47%), BK2022-6 (3.76%)and BK2022-7 (0.91%). This founding were conformity with This founding were conformity withSahu*et al.*, (2023) in kodo millet. Fifty-eight mutants were selected from the M_3 generation based on the contributing traits and seed yield.These selected mutants were compared to the previous generation and their productivity as traits were evaluated in the M_4 generation. The results indicated a significant improvement in seed yield and its contributing features in the M_4generation in comparison to the M_3 generation. This result were accordance withVasisth*et al.*,(2023) in finger millet.

Grain weight per panicle

Whereas 111 mutant lines exhibited better improvement for grain weight per panicle when compared to Indira kodo-1.In case of grain weight per panicle mutant lines 2022-154 (1.33g) showed improvement of about 98.51% over check variety Indira kodo-1 (0.67g) followed by 2022-4 (1.32g) revealed improvement of about 97.01%, 2022-5 (1.31g) recorded improvement of about 95.52%, 2022-22 (1.30g) exhibited improvement of about 94.03%, 2022-176 (1.29g) observed improvement of about 92.54%, 2022-151 (1.27g) showed improvement of about 89.55%, 2022-105 (1.26g) exhibited improvement of about 88.06%, 2022-170(1.24g) revealed improvement of about 85.07%, 2022-194 (1.21g) showed improvement of about 80.60%, 2022-186 (1.19g) observed improvement of about 77.61%, 2022-251 (1.18g) revealed

improvement of about 76.12%, 2022-200 (1.16g) exhibited improvement of about 73.13% (fig 2).12 mutant lines showed better improvement when compared to Indira kodo-1, the 100% improvement was found in BK2022-1 and BK2022-68 followed by BK2022-12 and BK2022-29 (32.50%), BK2022-76(28.75%), BK2022-99(23.75%), BK2022-4 (21.25%), BK2022-7 (18.75%), BK2022-2 (12.50%), BK2022-23 and BK2022-80 (5%) for seed weightperpanicle.The outcome was in accordance with works of Prasanna *et al*.,(2013) in Italian millet;Sabeil *et al*., (2014) in pearl millet; Soa*et al*., (2017) in kodo millet for grain yield.

Test weight

Among 110 mutant lines performed best for test weigth when compared to Indira kodo-1 (check variety). About test weight mutant lines 2022-99 (7.42 g) showed improvement of about 93.26% over check variety Indira kodo-1 (3.84 g). Whereas 2022-83 (6.95g) exhibited improvement of about 80.92%, 2022-153(6.00g) showed improvement of about 56.25%,2022-217 (5.95) revealed improvement of about 54.90%, 2022-74 (5.88g) recorded improvement of about 53.05%, 2022-51 (5.80g) showed improvement of about 51.13%, 2022-44 (5.73g) exhibited improvement of about 49.28%,2022-151(5.72g) recorded improvement of about 48.98%, 2022-85 (5.56g) revealed improvement of about 44.82% and 2022- 186 (5.31g) recorded improvement of about 38.28% for test weight (fig 3).100 mutant lines evaluated, 52 lines performed best for test weight when compared to Indira kodo-1 (check variety). Highest improvement was found in BK2022-64 (77.39%) followed by BK2022-4 (64.78%), BK2022-63 (43.70%), BK2022-5 (36.96%), BK2022-38 (34.13%) and lowest in BK2022-39 and BK2022-25 (0.22%).

Length of raceme

In case of length of raceme mutant lines 2022-251 and 2022-267 (mean value 15.20cm) showed improvement of about 54.77 % over check variety (Indira kodo-1) 14.24.The maximum improvement in the menifestation of yield was showed by number of grains per panicle followed by grains weight per panicle and test weight suggesting scope for improvement in these traits (table1). In current experiment, it was noties that the percentage improvement of mutant lines in M_3 generation which can use for further experiment in M_4 generation.The maximum improvement in the manifestation of yield was exhibited by test weight followed by seed weight per panicle and grain per panicle suggesting scope for improvement in these characters.It was observed that the percentage improvement of mutant lines in M_1 generation which can use forfurther experiment in M_2generationPrevious work was reported by Sahu*et.al*., (2023) in kodo millet.

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Table 1. Percentage improvement in M_3 generation of mutant lines compared with check varieties Indira kodo-1

SN	Numberofgrains per panicle		SN	Grainsweightpar panicle	
	Mutant lines	Improvement%		Mutant lines	Improvement %
1	2022-6	69.70	1	2022-4	97.01
2	2022-28	38.89	2	2022-5	95.52
3	2022-8	32.81	3	2022-1	61.19
4	2022-20	9.38	4	2022-3	41.79
5	2022-29	8.51	5	2022-2	38.81
SN	Testweight		SN	Length of raceme	
	Mutant lines	Improvement %		Mutant lines	Improvement %
1	2022-13	40.51	1	2022-251	54.77 %
2	2022-1	38.51	2	2022-267	54.77 %
3	2022-2	25.00			
4	2022-5	23.16			
5	2022-4	20.61			

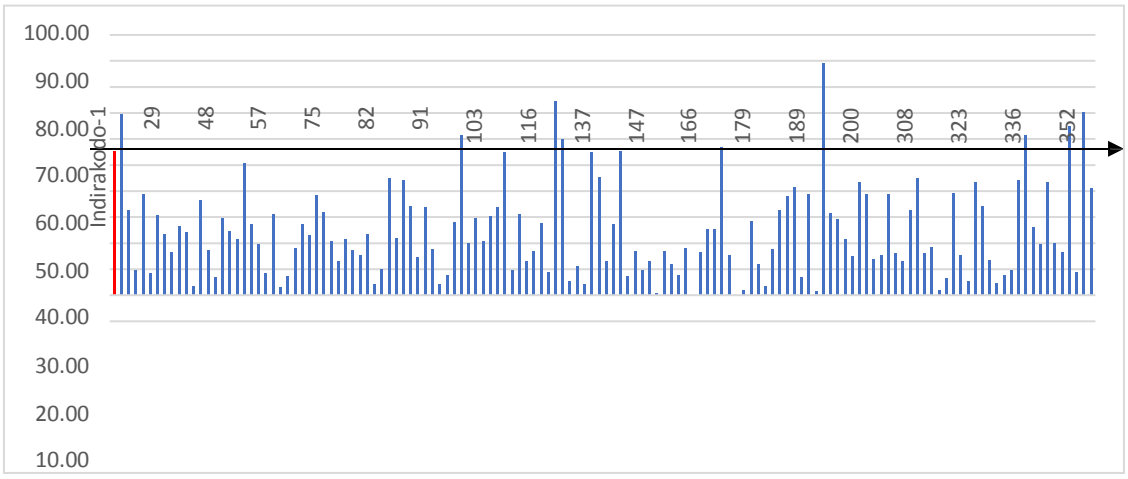

Fig1: Improvementinnumberofgrainperpanicleofmutantlinesascomparion to Indira kodo-1

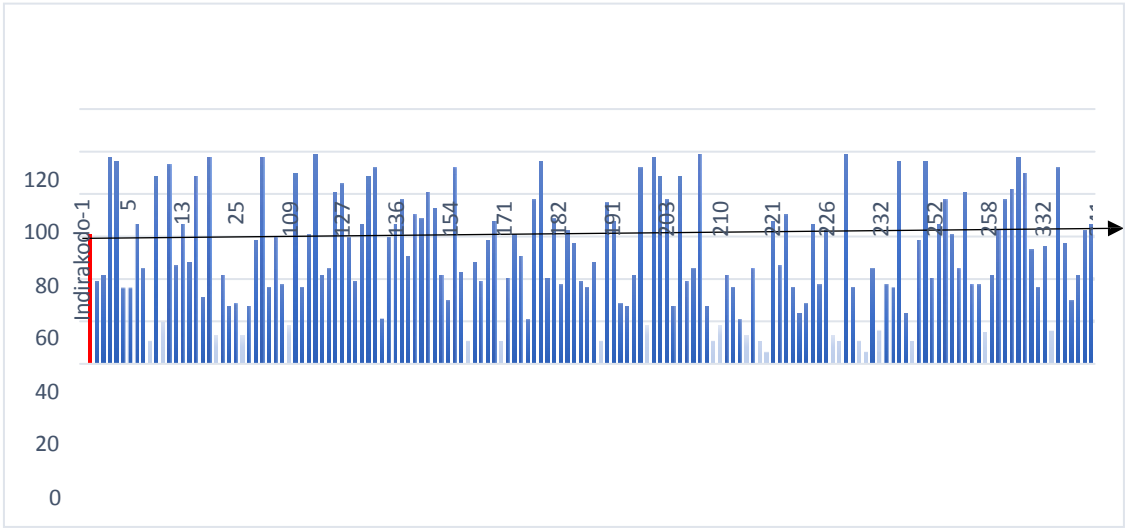

Fig2: Improvementingrainweightperpanicleofmutantlinesascomparion to Indira kodo-1

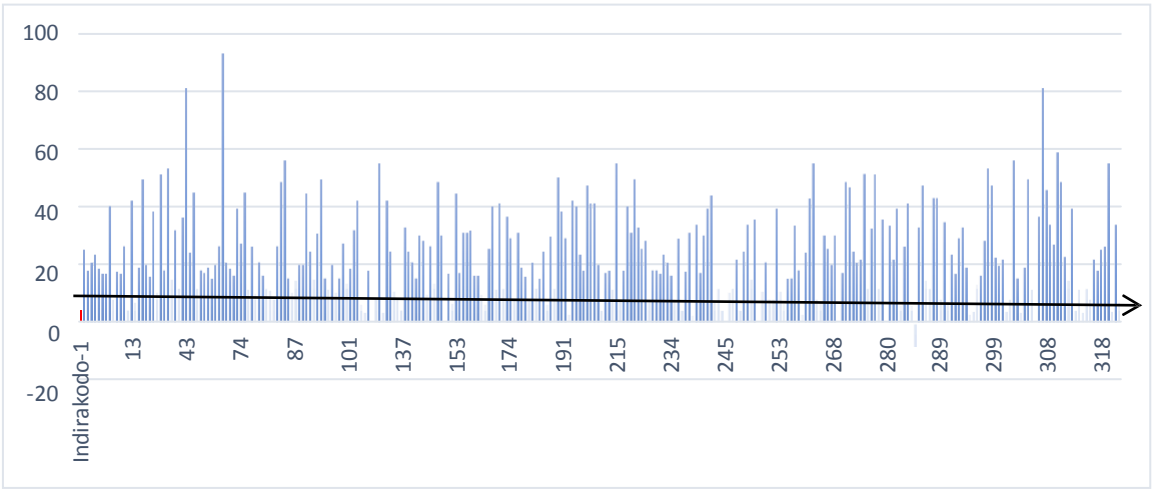

Fig3: Improvementintestweightofmutantlinesascomparionto
Indira kodo-1

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