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Response of Kodo Millet Varieties to Different Fertility Levels under Rainfed Conditions of *Kymore* Plateau

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Abstract Studies conducted to assess the response of different Kodo millet varieties to different fertility levels under rainfed conditions revealed that increased yield of Kodo millet can be obtained when Kodo millet variety RK 390-25 was grown with the application of 40 kg N and 20 kg P per hectare under rainfed conditions of Rewa. Among the varieties, RK 390-25 recorded maximum grain yield (21.13 t/ha) closely followed by RBK 155 (18.53 t/ha). All the growth, yield attributing characteristics and yield (grain and straw) enhanced markedly with increasing level of fertility up to 40 kg N/ha and 20 kg P/ha. The magnitude of the effect of highest dose of nutrients resulted in highest grain and straw yield i.e. 19.65 and 41.36 q/ha, respectively, being higher by 4.43 and 11.24 q/ha, respectively over control.

Keywords Kodo millet, Varieties, Fertility levels.

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Introduction

Wide adaptation, easy cultivation, negligible pests diseases and drought tolerance have made these crops more suited for sustainable agriculture to dryland areas. Among the millet crops, Kodo millet (*Paspalum scrobiculatum*) is predominantly grown in the dry tribal tracks of Madhya Pradesh. It is mostly cultivated by small and marginal farmers without adoption of recommended production technology speciality negligence of improved varieties and balanced fertilizer application. The productivity of Kodo millet is very low due to conventional use of indigenous cultivars coupled with low level of crop management [1]. The common belief that small millets may not profitably respond to applied nutrients under rainfed condition is a myth. No doubt application of fertilizers becomes essential need for high yielding varieties of small millet to exploit their maximum potential. Besides other agronomic inputs, optimization of fertilizer and selection of suitable cultivar are extremely important for improved yields. Less information is available with regard to improved varieties and fertilizer requirement in case of Kodo millet which is most essential to increase its productivity. Therefore, the present study was conducted to determine the suitable varieties as well as the fertilizer requirement for maximum yield of Kodo under rainfed conditions of *Kymore* plateau.

Materials and Methods

The field experiment was conducted during *kharif* seasons of 2013 at Instructional Farm, College of

Agricultural, JNKVV, Rewa, Madhya Pradesh. Rewa is situated in the North eastern part of Madhya Pradesh at 20°21′ North latitude, 81°15′, East longitude and 365.7 meters above sea level. Total annual rainfall is about 980 mm (39 inches) and more than 80% generally occurs during the monsoon season (June-September). The soil of the experimental field was mixed red and black with clay loam in texture and slightly alkaline in reaction with pH 7.7, EC 0.32 dS/m having organic carbon 0.61% and available nitrogen 270 kg/ha, phosphorus 16.4 kg/ha and potassium 352 kg/ha at 0-15 cm soil depth. The experiment was laid out in split plot design with eighteen treatments and three replications. The main plot treatments comprised of six Kodo millet varieties viz. TNAU95, RK 5, DPS 72, DPS 45, RBK 155 and RK 390-25 while the sub plot treatment comprised of three fertility levels (0-0-0; 20-10-0; 40-20-0 kg ha^{-1} N-P_2O_5-K_2O). The nitrogen was applied through urea in three split doses. Half dose of N and full doses of P was applied as basal just before sowing the crop and remaining half dose of N was applied in two equal splits i. e. at active tillering and panicle initiation stage of the crop. The other agronomical cultural practices such as irrigation, weeding and plant protection measures have been performed as per requisite. The crop was harvested manually at the maturity variety wise and the grain and straw yields were recorded.

Results and Discussion

The grown parameters of different Kodo millet varieties under the influence of different fertility levels are summarized in Table 1. It reveals that the plant height, number of tillers per meter row length, number of leaves per plant and leaf area index were found to differ significantly amongst the Kodo millet varieties. Variety RK 5 was found have highest plant height whereas variety RK 390-25 had lowest plant height. In term of other growth characters viz., number of tillers per meter row length, number of leaves per plant and leaf area index variety RK390-25 was found to be superior over rest of the varieties and registered maximum number of tillers per meter row length (77.00), number of leaves per plant (11.80) and leaf area index (3.29). Whereas, variety RBK 155 closely followed the RK 390-25 in all the above

Table 1. Growth parameters of Kodo millet varieties influenced by different fertility levels.

Treatments	Plant height (cm)	Number of tillers/ row length	Number of leaves/ plant	Leaf area index	Number of panicle/ plants
Varieties					
TNAU95	63.93	41.67	10.13	2.89	4.93
RK 5	66.87	69.33	12.60	3.22	6.60
DPS 72	65.47	52.67	11.80	2.87	5.53
DPS 45	62.07	59.00	12.47	3.21	5.87
RBK 155	65.80	73.67	12.73	3.23	7.80
RK 390-25	61.13	77.00	15.60	3.29	7.80
CD (p=0.05)	2.82	2.69	0.48	0.12	0.26
Fertility levels					
N_0P_0	63.17	57.33	11.10	2.85	5.30
$N_{20}P_{10}$	63.27	60.67	12.67	3.17	6.60
$N_{40}P_{20}$	66.20	68.67	13.90	3.35	7.37
CD (p=0.05)	1.99	1.69	0.34	0.09	0.19

growth parameters. So much variation in growth parameters in different varieties was owing to variations in their genetic inheritance in these characters. In fact the growth parameters among the varieties are genetically governed. Such type of observations among the Kodo millet varieties have also been reported by Pradhan et al. [2].

All the growth parameters increased up to significant extent with the increase in the fertility level from N_0 P_0 to $N_{40}P_{20}$. Thus, the maximum fertility level (N_{40} P_{20}) recorded maximum plant height (66.20 cm), tillers (68.67/m row length), leaves (13.90/ plant) and leaf area index (3.35). On the other hand, the corresponding values in case of N_0P_0 were almost significantly lowest. The maximum growth parameter under maximum fertility level may be owing to the immediate availability of nitrogen and phosphorus in the requisite amount from the 100% NP fertilizers. The increase in plant height, tillering and leaves number might be due to role of N and P in rapid multiplication of tissues and increase in amount of growth substances such as normally occurring phytohormones and increase in auxin supply with higher level [3].

Table 2. Yield attributes and yields of Kodo millet varieties influenced by different fertility levels.

Treatments	Number of grains/ panicle	Length of panicle (cm)	Weight of grains/ panicle (g)	Test weight (g)	Grain yield (q/ha)	Straw yield (q/ha)
Varieties						
TNAU95	99.33	8.13	0.51	4.36	14.06	25.43
RK 5	136.40	10.40	0.67	4.64	18.04	29.43
DPS 72	125.20	8.47	0.58	3.73	16.01	33.30
DPS 45	127.13	10.03	0.59	4.14	17.05	36.33
RBK 155	150.67	12.00	0.78	4.39	18.53	40.57
RK 390-25	167.87	12.03	0.80	4.10	21.13	43.29
CD (*p*=0.05)	5.48	0.33	0.02	0.16	0.87	0.97
Fertility levels						
N_0P_0	126.43	9.42	0.63	3.80	15.22	30.12
$N_{20}P_{10}$	130.80	9.68	0.63	4.23	17.54	32.70
$N_{40}P_{20}$	146.07	11.45	0.71	4.65	19.65	41.36
CD (*p*=0.05)	3.87	0.23	0.01	0.11	0.61	NS

The yield attributing characters viz. number of panicles/plant, number of grains/panicle length of panicle, weight of grains/panicle and test weight were found to deviate up to significant extent due to different varieties and fertility levels (Table 2). Out of six varieties, RK 390-25 and RBK 155 brought about significantly and equally higher number of panicles (7.80/plant) over all the remaining varieties. However, the other yield attributing characters viz. number of grains/panicle length of panicle, weight of grains/panicle and test weight were in the highest range in case of variety RK 390-25 and closely followed by variety RBK 155. This type of variations may be owing to variations in the genetic build up of the varieties. In fact it is very difficult to inherit all the desirable characters in one variety although efforts are being made in this direction [4].

The highest fertility level ($N_{40}P_{20}$) resulted in significantly higher above mentioned yield attribute over the lower fertility levels (N_0P_0 and $N_{20}P_{10}$). The number of panicles was 7.37/plant, grains/panicle was 146.07, panicle length 11.45 cm, grains weight/ panicle 0.71 g and 1, 000-grain weight 4.65 g due to highest fertility level. This might be attributed to the maximum increase in growth parameter including number of leaves/plant due to applied 100% nitrogen and phosphorus. Increased photosynthetic surface (leaves) brought about increased production of photosynthates and thereby increased translocation of photosynthates from source to the sink. The present results corroborate with those of Jain and Poonia [5].

The grain and straw yields were secured maximum from RK 390-25 variety i.e. 21.13 and 43.29 q/ha, respectively. However, the harvest index was in the lower range (33.55%). The second best variety was RBK 155 producing 18.53 q/ha grain and 40.57 q/ha straw with 31.69% harvest index. The third best variety was RK 5 producing 18.04 q/ha grain, lower 29.43 q/ha straw but maximum 37.10% harvest index. TNAU 95 was found lowest producer of grain and straw i.e. 14.06 and 25.43 q/ha, respectively. The higher productivity in case of RK 390-25 and RBK 155 might be owing to increased number of panicles per plant, the main yield attributing character. The increased yields due to increased yield attributing characters have also been reported by Basavaajappa et al .[6].

The highest fertility level ($N_{40}P_{20}$) proved significantly superior to the lower fertility levels with respect to grain and straw yields of Kodo millet. The highest fertility level ($N_{40}P_{20}$) resulted in highest grain and straw yield i. e. 19.65 and 41.36 q/ha , respectively, being higher by 4.43 and 11.24 q/ha, respectively over No Po. The highest yield parameters due to highest fertility level might be owing to the highest yield attributing parameters. The present results agree with those of Channappagoudar et al. [7].

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