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Production and Economic Efficiencies as Influenced by Mustard Genotypes in Paddy Fallows of Tungabhadra Command Area of Karnataka

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A B S T R A C T

A field trail was carried out at Agricultural Research Station, Siruguppa, Karnataka during summer 2016-2017 to study the production and economic efficiencies as influenced by mustard genotypes in paddy fallows of Tungabhadra Command Area of Karnataka. The experiment conducted on deep black soil with available nitrogen, P_2O_5 and K_2O of 190.2, 18.6 and 325.4 kg/ha, respectively. The experiment consists of ten genotypes viz., V_1: Pusa Mustard 25, V_2: Pusa Mustard 26, V_3: Pusa Mustard 27, V_4: Pusa Mustard 28, V_5: Pusa Mustard 29, V_6: Pusa Jagnath, V_7: Pusa Mehak, V_8: Pusa Tarak, V_9: Pusa Agrani and V_{10}: NRCHB 101, these genotypes were laid out in a complete randomized block design with three replications. The seeds of these genotypes were sown manually at a spacing of 60 X 10 cm immediately after the harvest of kharif paddy crop with minimum land preparation. The common fertilizer dose of 90:60:30 kg NPK/ha was applied in the form of urea, diammonium phosphate (DAP) and muriate of potash (MOP). All other recommended agronomic practices were uniformly followed as per the university's manual of Package of Practices. The results reveal that, Pusa Mustard 25 recorded significantly superior seed yield (872 kg/ha) and stalk yield (1363 kg/ha) over other genotypes with an yield advantage ranged from 7.11 to 58.9 % over Pusa Mustard 26 and Pusa Agrani (359 kg/ha), respectively. However, it was at par with V_1: Pusa Mustard 26 (810 kg/ha). Similarly maximum gross return (Rs. 40283/ha), net return (Rs. 28850/ha), BC ratio (3.52), Production efficiency (9.38 kg/ha/day) and economic efficiency (310.21 Rs./ha/day) were recorded in Pusa Mustard 25 compared to other genotypes and it was at par with Pusa Mustard 26. So, it can be conclude that Pusa Mustard 25 and Pusa Mustard 26 were found to be most suitable for paddy fallows in Tungabhadra command area.

Introduction

India occupies a major share in world oil seed production and it is third largest producer of Rapeseed after China and Canada with contribution of 28.3% in world acreage and 19.8% in production. It is cultivating on an area of 5.96 m ha with production of 8.32 m t and productivity of 1397 Kg/ha (Anon., 2018). The country has been facing the problem of shortage of oils coupled with continuous increase in their prices. Among the mustard growing states, Rajasthan is top Rapeseed and Mustard producing state which accounts to an extent of 48.12% followed by Madhya Pradesh and Haryana.

Indian mustard (*Brassica juncea (L.)* Czernj. & Cosson) is predominantly cultivated in Rajasthan, UP, Haryana, Madhya Pradesh, and Gujarat. It is also grown under some nontraditional areas of South India including

Karnataka, Tamil Nadu, and Andhra Pradesh. The crop can be grown well under both irrigated and rainfed ecosystem (Kapila *et al.*, 2012**)**. As we observe that there is enormous variability in the climatic and edaphic conditions in the mustard growing areas of India; the selection of appropriate cultivars is prime factor that would ameliorate in enhancing the productivity. Introduction of relatively short duration cultivar found favor with the environment where effective growing seasonal length is short (Kapila *et al.*, 2012**)**.

Tungabhadra command area is one of the most potential irrigated areas in Karnataka where in paddy - paddy is the predominant cropping system in the past years and known as rice bowl of Karnataka, But, in recent years due to vagaries of monsoon in the catchment area coupled with non availability of canal water to grow the second crop of paddy, which in turn prone to searching of an alternate crop suitable for effective utilization of the residual moisture planned to study the production and economic efficiencies as influenced by mustard genotypes in paddy fallows of Tungabhadra Command Area of Karnataka.

Materials and Methods

A field trail was carried out at Agricultural Research Station, Siruguppa, Karnataka during summer 2016-2017 to study the production and economic efficiencies as influenced by mustard genotypes in paddy fallows under Tungabhadra Command Area of Karnataka. The experiment conducted on deep black soil with available nitrogen, P_2O_5 and K_2O of 190.2, 18.6 and 325.4 kg/ha, respectively. The experiment consists of ten genotypes viz., V_1: Pusa Mustard 25, V_2: Pusa Mustard 26, V_3: Pusa Mustard 27, V_4: Pusa Mustard 28, V_5: Pusa Mustard 29, V_6: Pusa Jagnath, V_7: Pusa Mehak, V_8: Pusa Tarak, V_9: Pusa Agrani and V_{10}: NRCHB 101, these genotypes were laid out in a complete randomized block design with three replications. The seeds were sown manually in line at a spacing of 60 X 10 cm immediately after the harvest of kharif paddy crop with minimum land preparation. The crop was fertilized at the rate of 90:60:30 kg NPK/ha was applied in the form of urea, diammonium phosphate (DAP) and muriate of potash (MOP). Half of the nitrogen and full doses of P and K were applied at the time of sowing and remaining half of N was top dressed at 30 days after sowing. All other recommended agronomic practices were uniformly followed as per the university's manual of Package of Practices. The data on growth and yield parameters were recorded from 5 randomly selected plants in each genotype plot measuring 5.4 m^2 area. Seed yield (kg/ha) was calculated from net plot area. The cost of cultivation and relative economics of each genotype was calculated on the basis of prevailing market price of the inputs and the produce. Fisher method of analysis of variance was applied for analysis and interpretation of this data as given by Panse and Sukhatme (1967). To work out production efficiency and monetary efficiency following formulae were used;

$$\text{Production efficiency (kg/ha/day)} = \frac{\text{Grain Yield (kg/ha)}}{\text{Crop Duration (days)}}$$

$$\text{Production efficiency (Rs./ha/day)} = \frac{\text{Net Returns (Rs./ha)}}{\text{Crop Duration (days)}}$$

Results and Discussion

Growth, yield and yield parameters

Seed yield of mustard genotypes were significantly differed under field investigation. The highest seed yield (872 kg/ha) and stalk yield (1363 kg/ha) were registered by Pusa Mustad-25, which was

significantly superior to other genotypes and statistically comparable to Pusa Mustard 26 with 810 kg seed yield and stalk yield 1267 kg per hectare (Table 1). The similar results are also reported by Mostofa (2016). In the present study, production of higher yield by Pusa Mustard 25 and Pusa Mustard 26 might be due to the contribution of cumulative favorable effects of the crop characteristics *viz.*, days to 50 % flowering (39), days to maturity (93 and 92, respectively) number of branches per plant (11.13 and 10.33, respectively), siliquae per plant (97.87 and 86.17, respectively) and 1000 seeds weight (3.60 and 2.97, respectively) and plant height (101.3 cm and 101.0 cm, respectively). It appears that, seed yield was significantly and positively correlated with number of *siliquae*/ plant, 1000 seed weight, straw yield, plant height, biological yield and harvest index, which imply that seed yield, would increase with the increase of these yield attributes(Ana *et al.*, 2008 and Zehra *et al.*, 2009). In the present study, higher production efficiency was also registered by Pusa Mustard 25 (9.38 kg/ha/day) than rest of the genotypes (Table 2) and it was at par with Pusa Mustard 26 (8.81 kg/ha/day). These results are in line with finding of Meena *et al.*, (2013).

Significantly lower seed yield (359 kg/ha) and stalk yield (562 kg/ha) was observed by Pusa Agrani and it was mainly attributed to low growth parameters like number of branches per plant, siliquae per plant and 1000 seeds weight. Whereas, in another study conducted at Bapatla by Rajyalakshmi *et al.*, (2019) reported that PM-28 variety performed better with superior in growth parameters and yield advantage in rice fallows compared to Pusa bold. Keivanrad and Zandi (2014) observed that increase in seed yield has contributed more oil yield. Sana *et al.*, (2003) reported that, higher number of branches/plant is the result of genetic makeup of the crop and environmental conditions which play a remarkable role towards the final seed yield of the crop.

Table.1 Plant height, yield and yield parameters of mustard genotypes under irrigated condition

Genotypes	Day to 50% flowering	Day to Physio logical maturity	Plant height (cm)	Seed yield (kg/ha)	Stalk yield (kg/ha)	No. of branches/ pl	No. of Siliques /pl	1000 seed wt(g)
V_1: Pusa Mustard 25	39	93	101.3	872	1363	11.13	97.87	3.60
V_2: Pusa Mustard 26	39	92	101.0	810	1267	10.33	86.17	2.97
V_3: Pusa Mustard 27	41	95	75.9	613	955	9.57	76.40	2.51
V_4: Pusa Mustard 28	42	97	74.8	438	686	9.50	81.90	3.10
V_5: Pusa Mustard 29	40	95	85.3	510	798	9.47	80.90	3.26
V_6: Pusa Jagnath	41	96	83.1	471	736	8.33	69.97	3.17
V_7: Pusa Mehak	38	92	75.7	537	839	8.70	77.53	3.17
V_8: Pusa Tarak	42	96	84.3	405	634	8.43	77.13	2.76
V_9: Pusa Agrani	39	95	81.4	359	562	9.07	86.50	3.17
V_{10}: NRCHB 101	40	95	86.5	737	1151	10.40	93.27	3.47
SEm+/-			0.92	27	42	0.33	1.50	0.07
CD@5%			2.74	79	127	0.97	4.45	0.22

Table.2 Monetary returns of mustard as influenced by genotypes under irrigated condition

Genotypes	Gross returns (Rs/ha)	COC (Rs. /ha)	Net returns (Rs/ha)	BC ratio	Production Efficiency (kg/ha/day)	Economic Efficiency (Rs/ha/day)
V_1: Pusa Mustard 25	40283	11433	28850	3.52	9.38	310.21
V_2: Pusa Mustard 26	37411	11433	25978	3.27	8.81	282.36
V_3: Pusa Mustard 27	28281	11433	16848	2.47	6.45	177.35
V_4: Pusa Mustard 28	20225	11433	8792	1.77	4.52	90.64
V_5: Pusa Mustard 29	23567	11433	12134	2.06	5.37	127.73
V_6: Pusa Jagnath	21731	11433	10298	1.90	4.90	107.27
V_7: Pusa Mehak	24778	11433	13345	2.17	5.83	145.05
V_8: Pusa Tarak	18702	11433	7269	1.64	4.22	75.72
V_9: Pusa Agrani	16541	10950	5591	1.51	3.78	58.85
NRCHB 101	34007	11433	22574	2.97	7.75	237.62
SEm+/-	1225		1225	0.106	0.278	12.85
CD@5%	3668		3668	0.319	0.832	38.47

Monetary benefits

Mustard genotypes showed significant differences in the monetary returns (Table 2). Pusa Mustad-25 recorded significantly higher gross return (Rs. 40283/ha), net return (Rs.28850/ha), Benefit cost ratio (3.52) and economic efficiency (310.21 Rs./ha/day) compared to rest of the genotypes. However it was on par with Pusa Mustard 26 (Rs.37411/ha and Rs.25978/ha, gross and net returns, respectively). This higher gross return and net return was mainly attributed to higher yield in the same genotypes. Pusa Muastard 25 recorded significantly maximum economic efficiency (Rs. 310.21/ha/day) compared to rest of the genotypes. Whereas significantly minimum gross return (Rs. 16541/ha), net return (Rs. 5591/ha), Benefit cost ratio (1.51) and economic efficiency (Rs.58.85/ha/day) was registered with Pusa Agrani. This was mainly due to fewer yields.

Pusa Mustard 25 recorded significantly superior seed yield (872 kg/ha) and stalk yield (1363 kg/ha) with yield advantage ranged from 7.11 to 58.9 % over Pusa Mustard 26 and Pusa Agrani (359 kg/ha), respectively. Similarly maximum gross return (Rs. 40283/ha), net return (Rs. 28850/ha), BC ratio (3.52), Production efficiency (9.38 kg/ha/day) and economic efficiency (310.21 Rs./ha/day) were maximum in Pusa Mustard 25 compared to other genotypes and it was at par with Pusa Mustard 26. So, it can be conclude that Pusa Mustard 25 and Pusa Mustard 26 genotypes were found to be most suitable for paddy fallows in Tungabhadra command area of Karnataka.

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