RESEARCH ARTICLE

EVALUATION OF GENOTYPES WITH DIFFERENT FERTILITY LEVELS UNDER TIMELY IRRIGATED SOWN CONDITIONS OF HISAR

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Abstract: The experiment was conducted at Oilseeds Research Farm, CCS Haryana Agricultural University Hisar during rabi 2020-21 to evaluate promising Indian mustard genotypes under different fertility levels under timely irrigated sown conditions. The soil of experimental field was sandy loam in texture, with slightly alkaline in reaction (pH 8.0),low in organic carbon (0.34%), available N (162 kg/ha) were low, $P_2 0_5$ medium (12.3 kg/ha), and high in K_20 (330 kg/ha) and S (29 ppm). The experiment was laid in split-plot design with 7 genotypes (PDZ-12, PDZ-11, RCH-1, RH-749(ZC), PUSA MUSTARD 29, Kranti (NC) and PDZ 1) in main plots and three fertilizer levels (100% RDF: 80:30:20 kg NP_2O_5 and K_2O/ha, 125% RDF, 150% RDF) in sub plots with 3 replications. Maximum seed yield (2418 kg/ha) was obtained from the mustard genotypes RCH-1, which was significantly higher than the seed yield recorded in PDZ-11 and PDZ-1. RCH-1 was produced 27% and 11.67 % higher seed yield than PDZ -11 and PDZ-1, respectively. With addition of fertilizer, seed yield increased upto 125 % RDF, irrespective of genotypes. Mustard crop did not respond positively at 150 % RDF. Oil content was influenced significantly with mustard genotypes and fertility levels. Maximum oil yield was also produced by RCH-1 (943 kg/ha), being significantly at par with RH 749 and PM-29 and superior to rest of the genotypes. Variation due to interaction effect in mustard genotypes and fertility levels was not found to be significant.

Keywords: Genotypes, Fertility levels, Irrigated, Timely sown, Seed yield, Oil content

INTRODUCTION

In India, rapeseed-mustard is the main oilseed crop growing in rabi season occupying more than 80 percent of the area under oilseeds crop. The seeds contain oil (46-48 percent), 43.6 percent protein, and low glucosinolate content. Also, the seed residues are used as an ingredient for cattle and poultry feed in India. Mustard seed in general, contains 30-33 % oil, 17-25 % proteins, 8-10 % fibres, 6-10 % moisture, and 10-12 % extractable substances (Sudhir et al., 2013). Total area, production and yield of rapeseed-mustard in world during 2019-20 was 35.95 million hectares (mha), 71.49 million tonnes (mt) and 1990 kg/ha.

The area, production and productivity of rapeseed-mustard in India is 6.86 million ha, 9.12 million tonnes and 1331 kg/ ha, respectively during the 2019-20. The rapeseed-mustard yield slightly decreased during 2019-20 as compared to the previous years. Globally, India continues to be rank 2 nd after Canada in acreage (19.81%) and rank 4 th after Canada, European Union and China in production (10.37%). Rapeseed-Mustard crops in India are grown in diverse agro climatic conditions. Their contribution to the total acreage was 23.91% and oilseed production was 27.19%.Haryana, contributes 9.14 % of total area and 12.67 % of total production. It has been observed that at country level, the acreage of rapeseed-mustard slightly decreased by -0.64. However, increase in yield by 11.0% and production by 10.36% while, In Haryana increase 21.41 % area, 18.08 % production and while productivity decreased 4 % in 2019-20.

MATERIALS AND METHODS

The field experiment was conducted to study the impact of genotypes under different fertility levels, on growth, yield and quality of Indian mustard, at Research Farm of CCS, Haryana Agricultural University, Hisar, Haryana, India, situated at 29°10' N latitude and 75° 46' E longitude at an elevation of 215.2 m above mean sea level, during rabi season of 2020-21. Hisar has semi-arid climate with severe cold during winter and hot dry and desiccating winds during summer. Maximum temperature is about 45°C during hot summer months of May and June, while during winter months of December and January the minimum temperature may be sub zero. annual rainfall of the area is around 450 mm of which, 70-80 per cent is received during monsoon period i.e., July to September and the rest is received in showers of cyclic rains during the winter and spring seasons. The mean relative humidity remains nearly constant at about 75 to 90 per cent from July to March, steadily decrease in April and remains around 40-50 per cent during hot summer months of May and June. The mean meterological data of crop season 2020-21 given in Fig 1.The soil of the experimental field was

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sandy loam in texture, with slightly alkaline in reaction with ph 8.0, soil organic carbon (0.34%), available N (162 kg/ha) were low, P_2 0_5 medium (12.3 kg/ha), and high in K_20 (330 kg/ha) and S (29 ppm).

The experiment consisted of seven genotypes of Indian mustard (PDZ-12, PDZ-11, RCH-1, RH-749(ZC), PUSA MUSTARD 29, Kranti (NC) and n PDZ 1)in main plots and three fertilizer levels i.e. 100, 125 and 150% of the recommended dose of N and P (80kg N and 30kg P2 05 /ha) in sub-plots was laid out in split plot design with three replications Various genotypes were sown on October 22, 2020 with hand plough at a row to row distance of 30 cm. Thinning was done after about two weeks of sowing to maintain plant to plant spacing of 15 cm. Nitrogen was applied through urea in two splits (half as basal and half at flowering) and phosphorus at seeding through single super phosphate. The crop received only one post sowing irrigation at flowering. All other recommended package of practices was followed for raising the crop. The crop was harvested on March 12, 2021. Yield and yield attributes, oil and content were recorded to draw some valuable conclusions.

RESULTS

Genotypes affected the Plant height significantly. The significantly taller plants was observed by Pusa Mustard 29 (222 cm), which was at par with RCH-1 (213 cm), over to all other genotypes (Table 1).Minimum plant height was recorded PDZ 11 (192 cm) at par to national check- kranti (200 cm).The differences in plant height may be due to genetic characters.

Among the fertility levels, the plant height was not affected significantly due to fertility levels. However, taller plants were observed with 125 % RDF (205 cm).Yield attributes were significantly influenced by genotypes and fertility levels (Table1). Significantly number of siliqua per plant (437) seeds/ siliqua (15.6) and test weight (3.8g) were recorded in RCH-1, being significantly superior to other genotypes except RH-749 in case of test weight (6.70g and PM-29 (5.59g).The difference in yield attributes may be described to their individual varietal characters. Similar have been reported by Alam *et al*., 2014; Solanki and Mundra 2015 and Kumar *et al*., 2018.

Among the fertility levels, no of siliqua /plant and test weight of mustard differ significantly and observed that up to 125 % RDF produced higher number of siliqua /plant and test weight increased from 100 % RDF to 150 % RDF and significantly higher test weight was recorded with 150 % RDF over to 100 % RDF, while at par with 125 % RDF.

Maximum seed yield (2418 kg/ha) was obtained from the mustard entry RCH-1, which was significantly higher than the seed yield recorded in PDZ-11 and PDZ-1 (Table 2). With addition of fertilizer, seed yield also differed significantly irrespective of the entries. Significantly higher seed yield was recorded with fertility levels upto 125% increase in the recommended dose of NPK (80-30-20 kg/ha) which was statistically at par with 100 % RDF. Oil content was influenced significantly with mustard entries as higher oil content was recorded with mustard entry PM 29. Oil content differed statistically due to fertility levels (Table 2) and recorded higher oil content with 100 % RDF which was at par to 150 % RDF. As oil yield is a product of seed yield and oil content, same trend of seed yield was observed in oil yield also. Finding is supported by Kumar *et al*., 2018 and Banga *et al*., 2013.

Maximum oil yield was produced by the entry RCH-1 (943 kg/ha), being significantly superior to PDZ-11 and PDZ-1 entries (Table 2). Due to fertility levels, significantly higher oil yield (924 kg ha^{-1}) was recorded with 125% fertility level which was found to be statistically at par with 100 % RDF.results were supported by Jat *et al*., 2018, and Rana et al., 2021

Interaction effect in mustard entries and fertility levels was not found to be significant in case of seed yield (Table 3).All the genotypes positively responded up to 125 % RDFand then reduced the seed yield under 150 % RDF. RCH-1 under 125 % RDF produced significantly higher seed yield over to all treatments.

CONCLUSION

Maximum seed yield (2418 kg/ha) and oil yield (943 kg/ha) was obtained from genotype RCH-1, which was significantly superior to PDZ-11 and PDZ-1. Irrespected of genotypes, mustard crop respond up to 125 % RDF beyond the current recommendation of fertilizer (80:30:20) in Indian mustard under irrigated sown condition of Haryana.

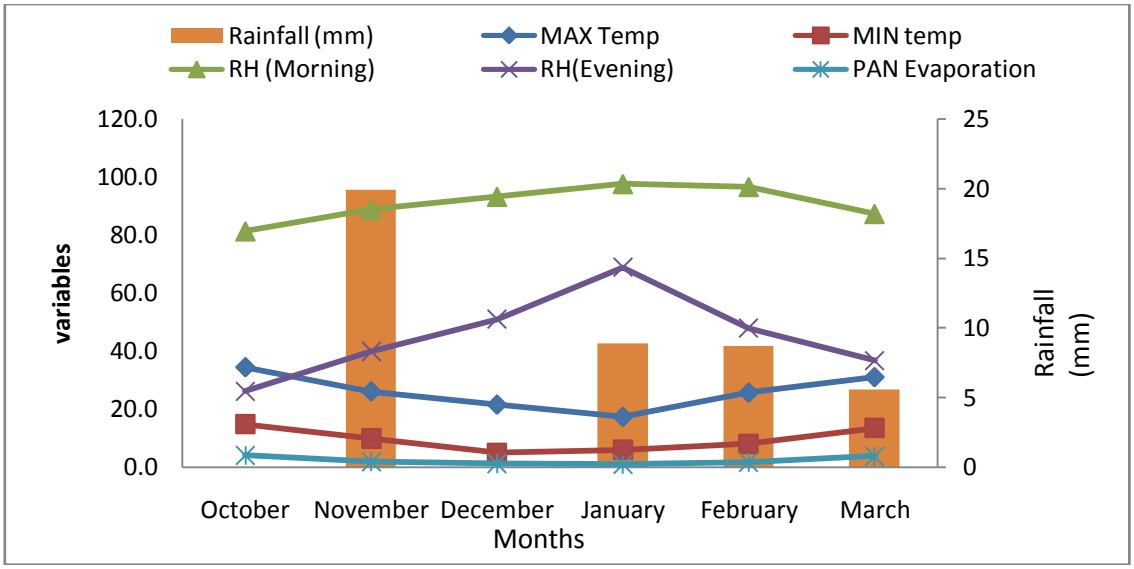

Fig 1: Mean monthly meteorological data during crop season (October 2020 to February 2021)

Table 1: Seed yield attributes of mustard as affected by entries and fertility levels

Fertility level/Entry	Plant ht (cm)	Main shoot ht (cm)	Primary branches (Nos.)	Secondary branches (Nos.)	Number of Siliqua/plant (Nos.)	Seeds/Siliqua (Nos.)	1000 seed wt (g)
Mustard entries							
PDZ-12	197	61.11	6.1	9.9	336	15.0	3.34
PDZ-11	192	65.11	6.6	10.7	365	13.7	3.32
RCH-1	213	68.00	8.0	12.2	437	15.8	3.80
RH-749(ZC)	199	71.44	3.7	8.9	238	13.2	6.70
PUSA MUSTARD 29	222	59.44	7.0	10.6	269	12.9	5.59
Kranti(NC)	200	83.67	4.6	11.0	269	14.0	4.56
PDZ 1	193	78.22	4.6	11.2	367	13.1	3.10
CD(p=0.05)	10	23.06	1.3	NS	94	NS	0.18
Fertility levels							
100% RDF	202	68.17	5.5	10.8	322	13.8	4.38
125% RDF	205	72.96	5.6	10.3	340	13.7	4.47
150% RDF	201	78.04	5.8	12.2	298	13.2	4.62
CD(p=0.05)	NS	NS	NS	NS	40	NS	0.30

Table 2: Seed yield (kg ha^{-1}), oil content (%) and oil yield (kg ha^{-1}) of mustard as affected by entries and fertility levels

Fertility level/Entry	Seed yield (kg/ha)	Oil content (%)	Oil yield (kg ha^{-1})
Mustard entries			
PDZ-12	2,258	39.0	879
PDZ-11	1,904	39.0	742
RCH-1	2,418	39.1	943
RH-749(ZC)	2,416	38.7	935
PUSA MUSTARD 29	2,372	39.1	928

Kranti (NC)	2,267	38.8	880
PDZ 1	2,165	38.7	838
CD (p=0.05)	**199**	**0.1**	**77**
SEm±	**69**	**0.01**	**27**
Fertility levels			
100% RDF	2,250	39.0	878
125% RDF	2,387	38.7	924
150% RDF	2,134	39.0	832
CD(p=0.05)	**172**	**0.02**	**67**
SEm±	**43**	**0.01**	**17**

Table 3: Interaction effect on seed yield ($kgha^{-1}$) of mustard entries under different fertility levels

Entries/Fertility levels	**100% RDF**	**125% RDF**	**150% RDF**	**Mean Entries**
PDZ-12	2,198	2,380	2,195	2,258
PDZ-11	1,905	1,939	1,867	1,904
RCH-1	2,354	2,702	2,197	2,418
RH-749(ZC)	2,459	2,525	2,262	2,416
Pusa Mustard 29	2,381	2,499	2,238	2,372
Kranti(NC)	2,309	2,373	2,120	2,267
PDZ 1	2,147	2,292	2,058	2,165
Mean Fertility levels	2,250	2,387	2,134	

CD (p=0.05) Entries at same level of fertility: 0.07; Fertility at same Entry: 0.08

Table 4: Interaction effect on oil yield ($kgha^{-1}$) of mustard entries under different fertility levels

Entries/Fertility levels	**100% RDF**	**125% RDF**	**150% RDF**	**Mean Entries**
PDZ-12	852	913	872	879
PDZ-11	753	751	720	742
RCH-1	912	1047	871	943
RH-749(ZC)	955	973	877	935
PUSA MUSTARD 29	944	971	870	928
Kranti(NC)	895	923	821	880
PDZ 1	832	888	795	838
Mean Fertility levels	878	924	832	

CD (p=0.05) Entries at same level of fertility :**NS** ;Fertility at same Entry :**NS**

Table 5: Interaction effect on oil content (%) of mustard entries under different fertility levels

Entries/Fertility levels	**100% RDF**	**125% RDF**	**150% RDF**	**Mean Entries**
PDZ-12	38.75	38.35	39.75	38.95
PDZ-11	39.55	38.75	38.55	38.95
RCH-1	38.75	38.75	39.65	39.05
RH-749(ZC)	38.85	38.55	38.75	38.72
PUSA MUSTARD 29	39.65	38.85	38.9	39.13

Kranti(NC)	38.75	38.9	38.75	38.80
PDZ 1	38.75	38.75	38.65	38.72
Mean Fertility levels	39.01	38.70	39.00	

CD (p=0.05) Entries at same level of fertility :0**.074**;Fertility at same Entry :**.079**

REFERENCES

Alam, M.J., Ahmed, K.S., Mollah, M. R. A., Tareq, M.Z. and Alam, J. (2014). Effect of planting dates on the yield of mustard seed. International *Journal of Applied Science & Biotechnology*, **3**(4): 651-654.

Google Scholar

Solanki, N.S. and Mundra, S.L. (2015). Phenology and productivity of mustard (Brassica juncea L.) under varying sowing environment and irrigation levels. *Annals of Agriculture Research*, **36** (3): 312-317.

Google Scholar

Rana Akash, Sharma, G.D., Kumar, Naveen and Sankhyan, N.K. (2021). Performance of new genotype of Indian mustard (*Brassica juncea* (L.) Czernj. Cosson) as influenced by sowing time and nutrient management. *Himachal Journal of Agricultural Research*, **47**(2): 206-213 (2021).

Google Scholar

Jat, A.L., Desai, A.G., Prajapati, K.P., Patel, P.J. and Patel, J.R. (2018). Effect of fertility levels on growth, yield andeconomics of Indian mustard (Brassica juncea L.) undernorth Gujarat region. *Journal of Pharmacognosy and Phytochemistry*, **7**(3): 1649-1652.

Google Scholar

Sudhir, K., Sairam, R.K. and Prabhu, K.V. (2013). Physiological traits for high temperature stress tolerance in B. juncea. *Indian J. Plant Physiol*., **18**: 89-93.

Google Scholar