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Response of Integrated Nutrient Management on Growth and Yield of Indian Mustard [*Brassica Juncea* (L.) Czern. & Coss.] Irrigated Conditions of Punjab

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ABSTRACT

Experiment was conducted during *rabi* season of 2015-16 at the Agricultural Research Farm Dhablan of the G.S.S.D.G.S. Khalsa college Patiala, Punjab. The experiment was laid out in randomized block design with 3 replications and 13 treatment combination of integrated nutrient Management. The soil of experimental field was clay in texture with pH 7.2 and contained organic carbon 0.80%, available nitrogen 374 kg/ha, available phosphorus 30.32 kg/ha and available K 120 kg/ha. All nutrients were applied in besal dose at one day before sowing. The crop was sown on 20th October, 2015. Application of Integrated nutrient Management significantly influenced the plant height, number of branches per plant, fresh weight of plant, dry weight of plant. The highest seed yield was recorded with the application of T_7 (100% RDF + 2t FYM ha^{-1} + 20kg S ha^{-1} + 20kg $ZnSO_4$ ha^{-1} + 1t vermicompost ha^{-1} + Azotobacter Seed treatment) was found significantly higher over rest treatments.

Keyword: Indian mustard, Integrated nutrient management, Siliquae.

INTRODUCTION

Mustard is a major oilseed crop of India, it grown in tropical and temperate zones. They occupy a prominent place being next in importance to groundnut, both in area and production, meeting the fat requirement of about 50 percent population in India. It grown well from an altitude of 650 – 1500 meters, it require warm weather 20°C during seed germination, 15°C – 20°C during plant growth and long sunny bright days 25°C – 27°C at flowering and pod formation are most suitable for these crops. Mustard grow best under relatively cool temperatures upto flowering. These crops grow profusely at 30 – 60% relative humidity. Oilseeds have prestigious place in Indian agriculture next only to cereals. India is blessed with favourable agro-ecological conditions for the growth of wide range of cultivated, perennial and annual oilseeds. Oilseeds are the most important crops in India both in respect of remunerative return per unit area and wider adaptability under constrained agro-climatic conditions. The oilseed crop *Brassica* are the third important edible oil sources after groundnut and soyabean, accounting for over 13.2 per cent of world's edible oil supply. In India, mustard and rapeseed are the second most important oilseed crops after groundnut contributing about 30 per cent of total oilseeds production Chand *et al*. (2003) In India Oilseeds crop are cultivated on 26.82 million ha area with 31.1 million tonnes production (2010-11). The average yield of oil seeds crop in India is 1159 kg /ha.

MATERIALS AND METHODS

A field experiment was carried out during *rabi* season of 2015-2016 at the Agricultural Research Farm Dhablan is situated at about 24-46 ^{0}N latitude and 76-24 ^{0}E longitude at an altitude of about 250 m above the mean sea level. The experiment was laid out in randomized block design with 3 replications. From the five randomly selected plants the heights were recorded in cm. The numbers of branches were counted from the sample plants and the values of these were averaged. To study the fresh and dry weight of five plants were collected from the sampling rows of each plot at 30 days interval from sowing till harvest of the crop. These fresh samples were air dried and then dried in an oven at 60 ^{0}C till a constant weight was obtained and weighed to record the average dry weight of the plant. The weight of the sun dried harvested crop was recorded from net plot area and expressed in quintal per hectare after subtracting the seed yield. Seed yield of each plot excluding the border and sampling row was weighed in kilo gram and converted into quintal per hectare.

RESULT AND DISCUSSION

The use of integrated nutrient management is considered to be one of the most important factors to increase the plant height. The results of the present study showed that the application of integrated nutrient management statically

significant by increase the plant height at various stages of recorded. The plant height increase with increasing fertilizer dose of INM treatment T_7 (100% RDF + 2t FYM ha^{-1} + 20kg S ha^{-1} + 20kg $ZnSO_4$ ha^{-1} + 1t vermicompost ha^{-1} + Azotobacter Seed treatment) gives better response as comparison to other treatments. The beneficial effect of INM on plant height was also reported by Thaneshwar *et al.* (2017) in Indian mustard.

The result of the present study showed that the application of INM increase number of branches $plant^{-1}$ over control. The number of branch increased with increasing fertilizer dose levels of INM treatment seven gives better response as comparison to other treatments. This finding is also supported by Mohiuddin *et al.* (2011) Santosh *et al.* (2007) Singh and Kanaujia *et al.* (2009) in Indian mustard. In general, INM addition increased the fresh and dry weight of the plant compared to control treatment. Then fresh and dry weight of plant increase with increasing fertilizer dose levels of INM treatment T_7 (100% RDF + 2t FYM ha^{-1} + 20kg S ha^{-1} + 20kg $ZnSO_4$ ha^{-1} + 1t vermicompost ha^{-1} + Azotobacter Seed treatment) gives better response as comparison to other treatment.

Stover yield increased with increasing fertilizer dose levels of INM treatment seven gives better response as comparison to other treatments. The higher stover yield with the application of INM can be attributed to better growth of the plant as expressed in terms of plant height, number of branch $plant^{-1}$, fresh and dry weight of plant all above character responsible for stover yield. This finding is also supported by Singh and Kanajuia *et al.* (2009) and Mandal *et al.* (2006) in Indian mustard. The seed yield was affected by INM application. Such a positive yield response of INM application is obvious when it is limiting in the growing medium. Application of INM therefore provides better nutrition to Indian Mustard which resulted in higher seed yield. Increased in seed yield with the application of INM may be due to better growth of the plant as expressed in term of plant height, fresh. higher seed yield with the application of INM. This finding is also supported by Ramesh *et al.* (2009) in Indian mustard.

Table No.1 Effect of INM on plant height (cm) of Indian mustard at different stages of crop growth

Treatment	30 DAS	60 DAS	90 DAS	120DAS
T_1	16.13	29.13	84.47	85.93
T_2	19.27	35.13	87.87	90.20
T_3	19.40	36.17	88.20	90.20
T_4	20.53	38.00	89.57	91.57
T_5	22.63	38.37	91.00	93.00
T_6	23.60	45.10	91.87	93.87
T_7	25.10	45.90	100.13	102.80
T_8	19.20	32.90	86.63	88.63
T_9	22.20	37.73	87.40	89.40
T_{10}	22.47	36.93	88.70	90.70
T_{11}	22.80	34.83	89.40	91.40
T_{12}	23.03	37.53	89.27	91.27
T_{13}	23.40	43.20	90.13	92.13
Mean	**21.52**	**37.77**	**89.59**	**91.62**
SE(d)±	**NS**	**1.75**	**0.89**	**1.03**
CD (5%)	**5.94**	**3.96**	**2.00**	**2.33**

Table No.2 Effect of INM on number of branches of Indian mustard at different stages of crop growth

Treatment	30 DAS	60 DAS	90 DAS	120 DAS
T_1	1.13	2.33	3.73	5.07
T_2	2.07	3.93	5.40	7.23
T_3	2.47	4.13	5.73	7.73
T_4	2.80	4.33	6.07	8.07
T_5	3.33	4.53	6.53	8.53
T_6	4.53	4.53	6.70	8.70
T_7	5.67	6.93	6.93	9.00
T_8	1.67	2.93	4.93	6.93
T_9	2.60	3.87	5.87	7.87
T_{10}	3.13	3.47	5.47	7.47
T_{11}	3.13	3.80	5.60	7.60
T_{12}	3.97	4.40	5.73	7.73
T_{13}	4.33	5.27	5.87	7.80
Mean	**3.14**	**4.19**	**5.74**	**7.67**
SE(d)±	**NS**	**1.28**	**0.88**	**0.69**
CD (5%)	**6.21**	**2.89**	**1.98**	**1.56**

Table No.3 Effect of INM on number of leaves plant^{-1} of Indian mustard at different stages of crop growth

Treatment	30 DAS	60 DAS	90 DAS	120DAS
T_1	4.80	7.67	14.37	15.27
T_2	6.53	8.60	17.37	19.37
T_3	6.73	9.43	18.27	20.27
T_4	7.33	10.93	19.73	21.73
T_5	7.70	13.67	22.40	24.40
T_6	9.00	14.17	22.77	24.77
T_7	10.47	16.8	27.27	29.27
T_8	7.07	7.87	16.53	18.53
T_9	7.10	9.03	20.73	22.73
T_{10}	7.27	9.93	21.07	23.07
T_{11}	7.60	11.27	24.27	26.27
T_{12}	8.53	12.77	25.87	27.87
T_{13}	9.13	14.00	27.40	29.40
Mean	**7.63**	**11.24**	**21.39**	**23.30**
SE(d)±	**0.49**	**1.11**	**1.86**	**1.69**
CD (5%)	**1.10**	**2.51**	**4.19**	**3.83**

Table 4. Effect of INM on fresh weight (g plant^{-1}) of Indian mustard at different stages of crop growth

Treatment	30 DAS	60 DAS	90 DAS
T_1	4.73	19.73	114.60
T_2	6.13	21.60	117.37
T_3	6.67	21.67	118.27
T_4	6.07	23.03	119.73
T_5	5.60	25.45	122.40
T_6	6.93	33.26	122.77
T_7	6.60	34.20	137.46
T_8	4.60	20.18	116.53
T_9	5.67	21.23	120.73
T_{10}	5.80	22.93	121.07
T_{11}	5.87	24.59	124.27
T_{12}	6.43	24.79	125.87
T_{13}	5.80	26.29	127.40
Mean	**5.91**	**24.53**	**122.19**
SE(d)±	**0.80**	**1.78**	**1.50**
CD (5%)	**1.80**	**4.02**	**3.39**

Table No.5: Effect of INM on dry weight (g plant^{-1}) of Indian mustard at different stages of crop growth

Treatment	30 DAS	60 DAS	90 DAS
T_1	1.40	8.33	29.73
T_2	1.65	9.77	31.60
T_3	2.17	9.53	31.67
T_4	3.51	9.73	33.20
T_5	2.57	9.87	35.45
T_6	2.90	9.20	43.27
T_7	4.30	9.60	45.20
T_8	2.16	7.93	36.07
T_9	2.75	8.67	31.23
T_{10}	1.73	8.80	32.93
T_{11}	2.49	8.80	34.59
T_{12}	1.51	9.40	34.79
T_{13}	2.93	8.87	36.29
Mean	**2.47**	**9.11**	**35.08**
SE(d)±	**1.23**	**0.95**	**1.48**
CD (5%)	**2.79**	**2.14**	**3.34**

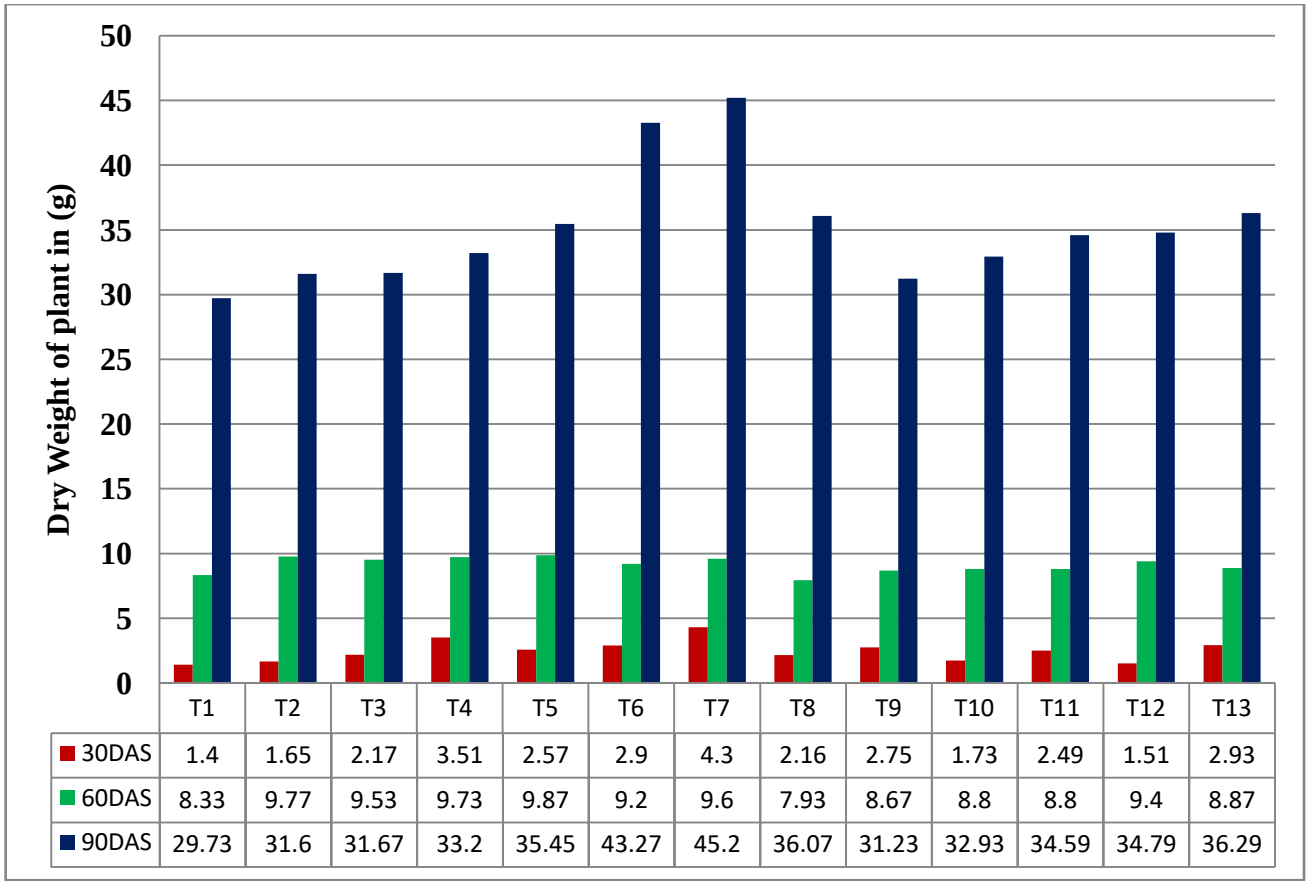
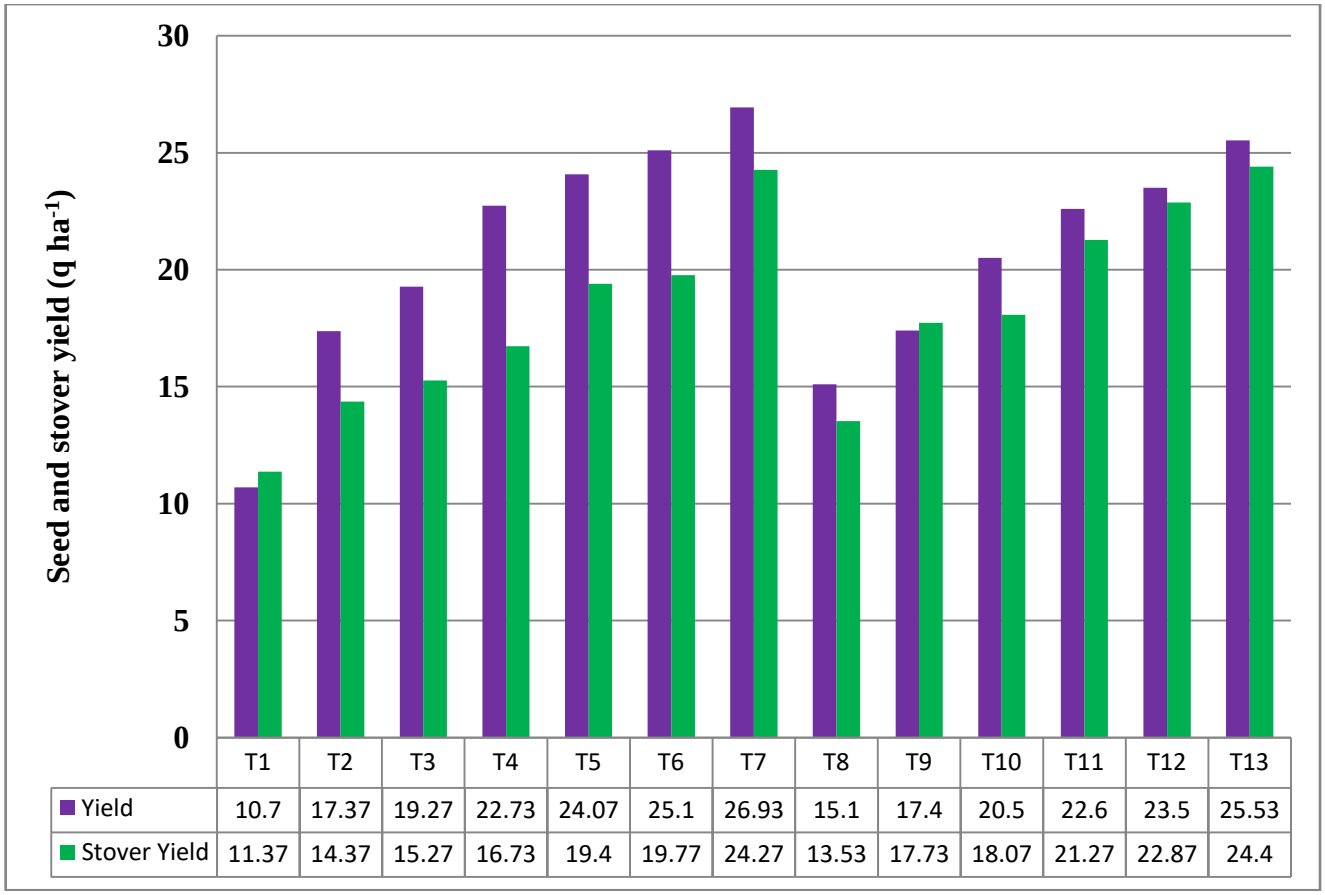


Fig. 1: Effect of INM on dry weight (g) of Indian mustard

Table No.6 Effect of INM on stover and seed yield (q ha^{-1}) of Indian mustard

Treatment	Stover Yield	Seed Yield q ha^{-1}
T_1	11.37	9.07
T_2	14.37	17.37
T_3	15.27	19.27
T_4	16.73	22.73
T_5	19.40	24.07
T_6	19.77	25.10
T_7	24.27	26.93
T_8	13.53	15.10
T_9	17.73	17.40
T_{10}	18.07	20.50
T_{11}	21.27	22.60
T_{12}	22.87	23.50
T_{13}	24.40	25.05
Mean	18.39	**20.66**
SE(d)±	**1.86**	**0.34**
CD (5%)	**4.19**	**0.76**



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13
Yield	10.7	17.37	19.27	22.73	24.07	25.1	26.93	15.1	17.4	20.5	22.6	23.5	25.53
Stover Yield	11.37	14.37	15.27	16.73	19.4	19.77	24.27	13.53	17.73	18.07	21.27	22.87	24.4

Fig. No. 2: Effect of INM on stover and seed yield (q ha-1) of Indian mustard

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