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Effect of Nitrogen and Phosphorus on Growth and Yield of *Brassica juncea* L.

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Abstract: An experiment to determine the effect of nitrogen alone and in combination with phosphorus on the growth and yield of *Brassica Juncea* L.Cv. The N - P levels (kg ha^{-1}) 0-0, 50-0. 100-0, 50-50, 100-50 and 150-50 were applied. The results revealed that plant height at maturity, number of branches, number of pods per plant, number of seed per pod and 1000 seed weight were affected significantly by N and N-P levels. Application of N-P at 100-50 kg ha^{-1} gave the highest seed yield. It was also noted that application of nitrogen over 100 kg ha^{-1} did not produce higher seed yield then 100-50 kg ha^{-1} N-P application.

Key words: N-P effect, *Brassica juncea*

Introduction

Oil and fat consumption in Pakistan has been increasing for the past few years. This is due primarily to a rise in population, which is alarmingly high at 3% per annum, and secondly to a gradual increase in per capita use which is a consequence of expanding urbanization and increasing house hold income (Khan *et al*., 1987). Rape seed and mustard have traditionally been used as a major source of oil in the sub-continent and other areas of the world for centuries. Rape seed and mustard belongs to family crucifereae commonly this crop is known as sarson, but technically these are two different types. Pakistan is the home of rape seed and mustard species, particularly of *Brassica Juncea*. In recent decades, the nutritional qualities of rape seed and mustard oil have received considerable attention in Europe and Canada. As a result of intensive crop breeding and through improvements in processing and refining techniques, rape seed and mustard oil has gained widespread acceptability as a cooking oil and as an ingredient in shortenings, margarine and salad dressings. An increasing demand for both oil and meal has resulted in a sharp rise in the seed area and in the production of rape seed and mustard in many countries throughout the world. Although these crops have not yet attained the status enjoyed by major cereal and cash crops including wheat, rice, cotton and sugarcane (Khan *et al.,* 1987). Our rape seed and mustard per hectare yield is very low as compared to other countries, however it can be increased by adopting improved agronomic practices (Anonymous, 1999). Fertilizer play an important role in plant growth and show significant increase in seed yield, number of grains per pod (capsule) and oil production. There is no uniform recommendations by the Agronomists regarding N-P fertilizer levels for unit area; Roy *et al*. (1981) and Khan *et al*. (1987) recommended 100-2 N-P kg ha^{-1} for higher seed yield of rape seed and mustard crop. While Imtiaz *et al.* (1992) and Muse *et al*. (1994) reported 100-75 N-P kg ha^{-1} for best seed yield of this crop. Hatam and Abbasi (1994) reported general fertilizer recommendation for Sindh, Punjab and NWFP as 112:56, 40:40 and 75:50 N-P kg ha^{-1} respectively. Keeping the above facts in view an investigation was undertaken to assess the influence of different N alone and N.P combination levels on the growth and yield of *Brassica Juncea* L., cultivar, Early Raya in the agroclimatic conditions of D.I. Khan.

Materials and Methods

Early Raya was conducted at the research area of Faculty of Agriculture, Gomal University, Dera Ismail Khan during the winter 1996-97. The experiment was laid in a randomized complete block design (RCBD) having four replications and eight treatments. Each sub plot size was 2m x 4m. The soil of research area was silty clay loam. The land was prepared by ploughing the soil several times by primary and secondary tillage implements. The cultivar "Early Raya" was sown on October 5, 1996. Seed was sown when soil was in vatter condition, in lines with a single line seed drill. Row to row spacing was 40 cm. Seed rate used was 5 kg ha^{-1}.

Urea and single super phosphate was used as a source of N-P fertilizer, respectively. All the phosphorus and ½ of nitrogen was given with 1st. irrigation. Near about 18 days after emergence the seedlings were thinned to maintain plant to plant distance of 15cm. First hoeing was done when plants were 6-8 cm height. and 2nd hoeing and weeding was done after the 2nd irrigation. 1st irrigation was applied one month after sowing and total four irrigation were given with interval of 20-25 days. Crop was attacked by aphids which were controlled successfully by spraying pesticide "Tameron" twice with 20 days interval. Crop was harvested when their stems and 75% pods becomes yellow and seed became dark and rattle in their pods when shaken. Dried crop was threshed by hand and seed was then winnowed, sun dried and stored. The collected data was analyzed by applying appropriate statistical techniques (Steel and Torrie, 1984).

Results and Discussion

Plant height at maturity (cm): Table 1 shows the effects of different fertilizer treatments on the plant height at maturity. Plot receiving 100-50 kg N.P. per hectare (T6) recorded maximum plant height of 140 cm, followed by T7 which was given and T2 was given giving 138 and 136.1 cm plant height, respectively. Whereas, untreated control (To) recorded minimum plant height of 127.50 cm per plant. This may be due to balanced amount of availability of nutrients for plant growth. These results are in agreement with the results obtained by Khan *et al.* (1987) and Singh (1992). Who recommended 100 kg N and 50 kg of P for producing the highest seed yield.

Number of primary branches per plant: Table 1 showed that different N and NP levels had significant effect on number of primary branches per plant. Application of 100-50 k g of N.P per hectare (T6) recorded maximum number of primary branches (8.25) per plant, followed by 150-50 kg N.P per hectare (T7) recorded (7.4) number of primary branches per plant and followed by (T2) 100-0 kg N.P per hectare have produced (7.0) number of primary branches per plant. However

Table 1: Effect of various N and P levels on the seed yield and yield components of early raya

Treatments	N levels (kg/ha)	P levels (kg/ha)	Plant height (cm)	Primary branches/ plant	Secondary branches/ plant	Pods/ plant	Seeds/ pod	Seed yield/ plant(g)	1000 seed weight (g)	Seed yield kg ha^{-1}
T0	0	0	127.5d	5.15f	10.81e	190.2d	15.35d	5.13e	3.70e	830g
T1	50	0	134.1c	6.60cd	20.45bcd	232.9abc	16.40bc	5.99d	3.83d	1033f
T2	100	0	136.1bc	7.00bc	22.94ab	246.5ab	16.30bc	6.95abc	4.11bc	1266d
T3	50	25	134.2c	5.50ef	17.05d	228.7bc	15.85cd	6.34bcd	4.04c	1052e
T4	100	25	134.1c	6.25d	16.96d	248.8ab	16.70ab	7.15ab	4.20ab	1390b
T5	50	50	135.5bc	6.10de	18.89cd	218.9c	16.30bc	6.49bcd	4.16abc	1061e
T6	100	50	140.5a	8.25a	25.05a	252.9a	17.00a	7.55Aa	4.25a	1516a
T7	150	50	138.0ab	7.40b	21.72bc	225.8c	16.25bc	6.14cd	4.18ab	1312c

untreated control (T0) produced minimum (5.15) number of primary branches per plant. The data indicate that, the number of primary branches were significantly increased over control. These results are similar with Imtiaz *et al.* (1992) and Muse *et al.* (1994). They reported that higher number of primary and secondary branches were recorded when the crop was fertilized with 100-75-0 NPK kg per hectare.

Number of secondary branches per plant: It is evident from table that all the fertilized plots produced more number of secondary branches than the unfertilized plots, but all fertilizer treated plots did not vary significantly from each other. Maximum number of secondary branches (25.50) per plant were recorded in case of T6 (100:50 kg N.P per hectare) followed by (T2) 100:0 kg N.P per hectare and (T7) 150:50 kg N.P per hectare giving 22.94 and 21.72 number of secondary branches per plant, respectively. Where as, untreated control To recorded minimum number of secondary branches per plant. It is also clear from the table that Luxuriant vegetative growth obtained by balanced dose of fertilizers. The results are highly significant over controlled. These results confirmed the result of Imtiaz *et al.* (1992) and Muse *et al.* (1994).

Number of Pods per plant: Data recorded showed that number of pods per plant were significantly increased by the application of fertilizers over control. But all fertilizer treated plots did not vary significantly from each other. Minimum number of pods were recorded where no fertilizer applied. While maximum number of pods per plant were obtained in case of T6 where plot was treated with 100-50 kg of N.P per hectare and number of pods recorded were per plant followed by T4 where 100-25 kg of N.P were applied per hectare and number of pods recorded were 248.8 per plant and T2 kg N.P per hectare had given pods per plant. This may be due to the healthier vegetative growth of T6 over other treatment causes more number of pods per plant. Bhatti *et al.* (1986) and Bajpai *et al.* (1992) have opinion that 100 kg N per hectare and 30 kg P per hectare resulted in increasing grain yield and yield components.

Number of Seeds per pod: As evident from the table the lowest number of 15.35 seeds per pod was recorded from untreated plot which were given no fertilizer and greatest with 100:50 kg N-P per hectare followed by 16.70 and 16.40 seeds per pods treated with 100:25 and 50:0 kg. N-P hector in T4 and T1, respectively. The data showed that there was significant increase in the number of seeds per pod as affected by fertilizer application over control. This was due to effective amount of N and P in T6 which not only increase the number of seeds per pod but also shortens the time required to complete canopy development as described by Khan *et al.* (1987). These results agree with that of Basak *et al.* (1990). They reported that maximum number of seeds per pod obtained from experimental fertilizer treatment of 100 kg N + 60 kg P per hectare.

Seed yield per plant (gm): The seed yield was significantly increased in all fertilizer treated plots over control but not vary significantly among all fertilizer treated plots. The treatment means comparison showed that higher seed yield per plant was recorded from T6 followed by T4 treated by 100-25 kg of N.P per hectare and T2 giving 7.15 and 6.95 gm seed yield per plant, respectively. Where the lowest seed yield per plant gm was recorded from untreated plots where no fertilizer were applied. The reason for higher yield in T6 was production of effective yield components which contributed towards grain yield. These result are supported by Roy *et al.* (1981) and Khan *et al.* (1987). They have recommended 100 kg N/ ha and 28 kg P/ha for maximum seed yield. They also stressed the need of nitrogen and phosphorus to promote the early plant growth.

1000-seed weight: Table 1 revealed that the application of Nitrogen alone increased the 1000 seed weight significantly over control but variation among some fertilizer treatment were not significant. The highest seed weight of 40.25 gm was obtained T6 kg N.P per hectare and T7 with 4.20 gm and 4.18 gm weight of 1000 seeds, respectively. The lowest seed weight of 3.7 gm of 1000 seeds was obtained form T0 which given no fertilizer. Kandera, (1988) and Shafi *et al.* (1992) observed that seed weight is controlled by environment, genetic make up, soil fertility specially soil nitrogen and phosphorus. The healthy growth of crop in T6 resulted in more translocation of photosynthates towards seed which resulted increased 1000-seed weight. These result are in agreement with Imtiaz *et al*. (1992). They advocated that 100-75-0 NPK kg ha^{-1} not only produced the highest seed yield but also gave heaviest 1000 seed weight.

Seed yield per hectare(kg): As evident from the Table 1, there is significant increase in the seed yield per hectare over control in fertilizer treated plots and fertilizer plot also vary significantly among each other. The highest seed yield per hectare was obtained from T6 giving 1516 kg of seed yield per hectare followed by T4 and T7 giving 1390 and 1312 kg of seed yield per hectare, respectively. However the lowest seed yield was obtained by untreated plot. Seed yield is the combined expression of all yield components. All yield components contributed towards the seed yield. By healthier growth of T6 made possible the highest seed yield. These result are agree with the Imtiaz *et al.* (1992) and Muse *et al.* (1994).

References

Anonymous, 1999. Economic survey of Pakistan. Finance Division, Economic Advisor Wing, Islamabad, Pakistan.

Bajpai, R.K., S. Pandey and J.K. Patel, 1992. Effect of irrigation and nitrogen fertilizers on grain yield of mustard. Adv. Plant Sci., 5: 129-133.

Basak, N.C., M.M.A. Karim and M.W. Zaman, 1990. Performance of some rapeseed lines under two different fertilizer levels. Bangladesh J. Agric. Res., 15: 70-74.

Bhatti, A.U., A.H. Gurmani, H. Rehman and J.K. Khattak, 1986. Response of sarson to alone and combined application of N, P and K under D.I. Khan conditions. Sarhad J. Agric., 2: 251-256.

Hatam, M. and G.Q. Abbasi, 1994. Oil Seed Crop in Crop Production. National Book Foundation, Islamabad, Pakistan, Pages: 378.

Imtiaz, M., H. Raiz, K.H. Anwar, A. Gulzar and C.A. Ghulam, 1992. Response of *Brassica* cultivars to fertilizer level under rain-fed condition. Pak. J. Soil Sci., 11: 60-63.

Kandera, J., 1988. Effect of N application to rape seed and mustard grown after maize. Field Crop Abstr., 42: 2364-2364.

Khan, A.R., M. Munir and M.A. Yousaf, 1987. Rape Seed and Mustard in Pakistan. Directorate of Publication Pakistan, Agricultural Research Council, Islamabad, Pakistan, pp: 1-6, 93.

Muse, M., N.K. Aadal, M.A. Shahzad, G.A. Chaudhry and A.H. Khalid, 1994. Yield potential and co-relation studies of mustard as effected by varying fertilizer doses and row spacing. Pak. J. Soil Sci., 11: 91-94.

Roy, V., S. Maiti and B.N. Chatterjee, 1981. Growth analysis and fertilizer response of 'Varuna' Indian mustard. Indian J. Agric. Sci., 51: 173-180.

Shafi, M., S. Khan and M. Nazir, 1992. Yield and yield components of wheat in relation to different phosphorus and radiation levels. Sarhad J. Agric., 8: 1-5.

Singh, S.S., 1992. Effect of fertilizer application and weed control on the yield of mustard (*Brassica juncea*). Indian J. Agron., 37: 196-196.

Steel, R.G.D. and J.H. Torrie, 1984. Principles and Procedures of Statistics. McGraw Hill Book Co. Inc., New York, USA.