INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2001/03–1–131–133
http://www.ijab.org

Effect of Time and Methods of N and P application on Growth, Seed Yield and Oil Quantity of Canola

MUMTAZ A. CHEEMA, M.A.MALIK†, S.M.A. BASRA‡ AND SHAHID IBN-E-ZAMIR†
Departments of †Agronomy and ‡Crop Physiology, University of Agriculture, Faisalabd-38040, Pakistan

ABSTRACT

The effect of time and method of N and P application on canola production was determined on a sandy loam soil having 0.057% N and 6.8 μ g^{-1} P during the year 1997-98. Both the NP fertilizers were applied in bulk either at sowing or with first irrigation using methods like broad cast, top dressing and side drilling. The results revealed that the treatment (T_6) where half N and P were applied by side drilling at sowing and remaining half N at Ist irrigation by side drilling produced the highest seed yield of 1704 kg ha^{-1}. On the contrary, the oil contents were not significantly influenced by time and method of fertilizer application.

Key Words: Fertilizer application; Canola; Growth; Oil contents

INTRODUCTION

Pakistan is facing an acute shortage of edible oil. The domestic edible oil production from all sources has grown at the rate of 2.56% annually over the last 24 years, whereas the domestic consumption is increasing at an annual rate of 9% (Anonymous, 1998). As a result, 653 US $ millions are being spent on import of 1.7 million tons of edible oil (Anonymous, 1999).

Rapeseed and mustard are important *Brassica* species being grown for immemorial times in Pakistan. Recently the newly introduced rapeseed canola (low in erucic acid) varieties are getting great popularity in Pakistan because of health concerns. Being a new introduction in the country, the production technology is still to be standardized. Besides many other factors, appropriate time and methods of fertilizer application lead to higher yields. Therefore, its proper and judicious use is of prime importance.

Singh *et al*. (1971) observed the highest seed and oil yields (1.24 and 0.5 t ha^{-1}, respectively) when whole of the N and P were applied by side drilling at sowing. Similarly, Bhatti *et al*. (1973) reported that N and P_2O_5 when applied at the time of sowing resulted in better yields. Increased seed yield in canola by side dressing. Similarly, Holmes and Ainsley (1978) observed that rapeseed increased seed yield when N, P_2O_5 and K_2O were applied as a side dressing to seedbed. Gupta and Saini (1982) concluded that yield of toria was similar when N applied at sowing or in two equal split dressing. In contrast Garcia and Alcontara (1983) reported that spring rape seed yield was not significantly influenced by rate and method of N application. Sharma and Gaur (1988) concluded that drilling of N at sowing resulted in highest yield. However, the oil contents were not affected by method of application; whereas, Majeed (1991) observed that application of NP at 3-4 cm depth along the rows at 6 cm apart from the seed rows increased the number of branches per plant, number of pods per plant, number of seeds per pod and seed yield. Similarly, Mendoza *et al*. (1993) reported increased seed yield by application of N as side drilling, while Aljaloud *et al*. (1996) observed increased plant height, biological yield and seed yield by different times and methods of fertilizer application. The project was planned to determine the proper time and method of N and P fertilizer for attaining high yield.

MATERIALS AND METHODS

Present studies pertaining to the effect of time and method of nitrogen and phosphorus applications on growth, yield and oil quantity of canola cv. Dunkled were conducted at the Agronomic Research Area, University of Agriculture, Faisalabad, during 1997-98. The experiment was laid out in a randomized complete block design with 4 replications using a plot size of 2.7 x 5 m on a sandy clay loam soil having 0.057 percent N and P 6.8 μg g^{-1}. The experiment consisted of following treatments: T_1; full N and P by broadcast method at seeding; T_2, half N and full P at seeding and remaining half N at first irrigation by broadcast method; T_3; full N and full P at first irrigation by top dressing; T_4 half N and full P at sowing and remaining half N at flowering by top dressing; T_5; full N and P by side drilling at seeding; T_6; half N and full P at seeding and remaining half N at first irrigation by side drilling; T_7; full N and P at seeding (below seed); T_8: half N and full P at seeding (below seed) and remaining half N at flowering.

The crop was sown on Oct. 7, 1997 with the help of hand drill on a well prepared seed bed maintaining 15 cm plant to plant and 45 cm row to row distance using seed rate of 5 kg ha^{-1}. A recommended fertilizer dose of 90-60 NP kg ha^{-1} was applied. The crop was kept free of weeds by hoeing twice during its growth period. The crop was harvested on April 11, 1998 and threshed manually.

Observations on different plant parameters like plant height, number of branches per plant, number of pods per plant, number of seeds per pod, biological yield, seed yield and oil percentage were recorded using standard procedures. The recorded data were analyzed statistically using Fisher's analysis of variance techniques and LSD test was applied at 5% probability level to compare the differences among treatment means (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Plant height was significantly affected by time and method of nitrogen and phosphorus application (Table I). Maximum plant height was observed at T_3 when whole N and P was applied at Ist irrigation by top dressing whereas minimum plant height was attained at T_7 where the whole N and P was applied at seeding below seed, that is statistically at par with T_1 (full N and P at seeding by broadcast) treatments. Whereas, treatments T_3, T_6 and T_8 are statistically similar. More plant height in T_3 may be due to better exploitation of resources at first irrigation over T_7 where the N and P fertilizers were applied below seed. The results of this study also corroborate the findings of Harris (1980) and Al-Jalond *et al.* (1996) who reported significant influence of time and method of N P fertilizer application on plant height. The data pertaining to number of branches plant^{-1} and pods plant^{-1} (Table I) revealed that both the parameters were significantly influenced by time and method of N P application. Treatment T_6 (half N and full P at seeding and remaining half N at Ist irrigation by side drilling) produced more number of branches (12) and that is statistically at par with T_3 against the minimum of T_7 where whole fertilizers were applied at seeding below seed, similarly maximum no of pods (419) was observed at T_6 and that is statistically at par with T_3 whereas T_7 produced minimum number of pods plant^{-1} (363). Increase in number of branches plant^{-1} and number of pods plant^{-1}, may be due to better management of nutrients and less wastage of nitrogen fertilizer particularly, increased the efficiency of N and P fertilizer application along with time. T_7 produced the minimum number of branches and number of pods and that may be due to more wastage and unavailability of fertilizer. The findings of this study are similar with the finding of Majeed (1991) who also reported similar results. Maximum number of seeds pod^{-1} (29) was also observed in T_6 against the minimum of T_1, T_2 and T_4 who produced (26) number of seeds pod-1.

Biological yield was also significantly influenced by time and method of NP application (Table I). Maximum biological yield was attained at T6 treatment (9907 kg ha^{-1}) where half N and full phosphorus was applied at seeding by side drilling and remaining half nitrogen was applied at Ist irrigation by side drilling. While the minimum biological yield (8730 kg ha^{-1}) observed at, T_7, that is statistically at par with T_1 and T_2, who produced 8395 and 8480 kg ha^{-1}, respectively. These results confirmed the findings of Al-Jaloud *et al.* (1996).

Data presented in Table I, further show that seed yield was also significantly affected by time and method of N and P application. Maximum seed yield (1704 kg ha^{-1}) was obtained in T_6 and differed significantly from rest of all other treatments. However, the minimum seed yield (1389 kg ha^{-1}) was attained in T_7 where whole N and P were applied at seeding below seed. Maximum seed yield at T_6

Table I. Effect of time and method of NP application on pods plant^{-1}, seed yield, oil contents and oil yield of canola cv Dunkled

Treatment	Plant height (cm)	branches/ plant	Pods/plant	Seeds/pod	Biological yield (kg/ha)	Seed yield (kg/ha)	Oil yield (kg/ha)	Oil contents (%)
T_1	164.10 c	10.00 b	363.80 bc	26.00 c	8395.00 d	1506 bc	628.66 e	45.26 ^{NS}
T_2	167.60 bc	11.50 ab	378.80 b	26.00 c	8480.00 d	1496 bc	674.39 d	45.08 ^{NS}
T_3	176.90 a	12.00 a	415.00 a	28.00 ab	9824.07 ab	1535 b	699.19 b	45.55 ^{NS}
T_4	171.10 abc	11.00 ab	390.30 ab	26.00 c	8900.00 cd	1481 bc	672.67 d	45.42 ^{NS}
T_5	167.60 bc	11.00 ab	382.30 b	28.00 ab	9237.03 abc	1472 bc	667.25 d	45.33 ^{NS}
T_6	176.10 ab	12.00 a	419.30 a	29.00 a	9907.40 a	1704 a	779.40 a	45.74 ^{NS}
T_7	162.60 c	10.00 b	363.30 c	27.00 bc	8730.00 d	1389 cd	683.57 c	45.39 ^{NS}
T_8	174.40 ab	10.00 b	364.30 bc	28.00 ab	9130.00 bcd	1509 bc	686.89 c	45.52 ^{NS}

T_1: Full N + P at seeding by broadcast method; T_2 : ½ N + full P at seeding and ½ N at Ist irrigation by broadcast method; T_3 : Full N + P at Ist irrigation by top dressing; T_4 : ½ N + full P at seeding and ½ N at flowering by top dressing; T_5 : Full N + P at seeding by side drilling; T_6 : ½ N + full P at seeding and ½ N at first irrigation by side drilling; T_7 : Full N + P at seeding below seed; T_8 : ½ N + full P at seeding below seed and ½ N at flowering

was attributed due to improved yield components like more number of branches plant^{-1}, pods plant^{-1}, seed pod^{-1}. Minimum seed yield at T_7 may be due to leaching of nitrogen fertilizer particularly that resulted minimum growth like plant height and biological yield and decrease in other yield components also. Whereas N applied in two splits by side dressing produced better yield components and yield. These results corroborate the findings of early workers (Nyborg & Henning, 1969) working on rapeseed in Canada reported when higher rates of fertilizer are used, placement away from the row produces much greater yield than placement below the seed or in the row which was generally inferior to placement or banding or side drilling. Seed oil contents were non significantly affect by time and method of N and P fertilizer application in all the treatments. These results are quite in line with the findings of Sharma and Gaur (1988) who also reported similar results.

CONCLUSION

It can be concluded from this study that application of half N and whole P at seeding by side drilling and remaining half nitrogen at first irrigation is most optimum for attaining high yield of canola under the agro-ecological conditions of Faisalabad.

REFERENCES

Al-Jaloud, A.A., G. Hussain, S. Karimulla and A.H. Alhamdi, 1996. Effect of irrigation and nitrogen on yield and yield components of two rapeseed cultivars. *Agri. Water Management,* 30: 57–68

Anonymous, 1995. *Annual Report of NODP*. PARC, Islamabad.

Anonymous, 1999. *Economic Survey of Pakistan.* Finance Division, Economics Adviser's Wing, Islamabad, Pakistan, pp. 10–11.

Bhatti, M.A., M.A. Khan and M. Ahmad, 1973. Studies of time of application of N and P fertilizers. *Annual Report, Rapid Soil Fertility and Soil Testing Institute, Lyallpur*: 56.

Garcia R. and R.A. Alacantara, 1983. Effect of method and rates of application of N fertilizer on *Brassica napus*. *In: 6th Intl. Rapeseed Conf.,* Paris, France: 292 (*Field Crop Absts.,* 37: 2566; 1984).

Gupta, T.R. and J.S. Saini, 1982. Effect of dates, rate and time of N application on seed and oil yield of Toria. *Indian J. Agron.,* 27: 326–9.

Holmes, M.R.J. and A.M. Ainsley, 1978. Seedbed fertilizer requirements of winter oilseed rape. *J. Sci. Food Agri.,* 29: 657–68.

Majeed, A., 1991. Effect of varying N applications on the growth and seed yield of "Peela Raya" (*B. carinata*). *M.Sc. (Hons.) Agri., Thesis,* Deptt. Agron. Univ. Agri., Faisalabad.

Mandoza, E., R.L. Villas Boas and J. Nakagawa, 1993. Effect of rates and dates of nitrogen application on development and yield of rape (*B. napus* L.) grown in parts in plastic tunnel. *Cientifica* (Jaboticabal), 21: 157–68 (*Field Crop Absts.,* 48: 9204; 1995).

Nyborg, M. and A.M. Henning. 1969. Field experiments with different placements of fertilizers for Barley, flax and rapeseed. *Canadian J. Soil Sci.,* 49: 79–88.

Sharma, S.K. and B.L. Gaur, 1988. Effect of levels and methods of N application on seed yield and quality of sunflower. *Indian J. Agron.,* 33: 330–31.

Singh, B.P., A.L. Bhola, K. Singh and T.P. Padva, 1971. Effect of placement of nitrogenous fertilizer on brown sarsoon grown under rainfed conditions. *Indian J. Agric. Sci.,* 41: 827–30.

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

(Received 26 July 2000; Accepted 10 October 2000)