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DETERMINATION OF OPTIMUM LEVEL OF NPK AND ITS EFFECTS ON YIELD, YIELD COMPONENT AND OIL QUALITY OF CANOLA (*Brassica napus* L.)

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ABSTRACT: In a field experiment the response of Canola to different levels of NPK (60-0-0,60-30-0,60-30-75, 90-30-75,90-60-75,90-60-100,120-60-75,120-60-100 and 150-90-100 kg ha^{-1}) was studied at the Agronomic Research Area, Sindh Agriculture University, Tando jam. Increasing levels of N, P and K significantly increased all the yield components and seed protein contents while decreased the seed oil contents in Canola. Maximum seed yield (2670.78 kg ha^{-1}) was recorded when Canola crop was fertilized at the rate of 90-60-75 kg NPK ha^{-1}.

Key words: Canola; fertilizer levels, seed yield oil content.

INTRODUCTION: - Pakistan is spending a huge amount of foreign exchange on the import of edible oil. The total requirement of edible oil for 2000-2001 was 1.9 million tones of which 32% was met from local production and remaining 68% was imported at the cost of US$ 788 million (Anonymous, 2001 which is a great burden on national economy. Rapeseed and mustard are the oil is of low Quality due to the presence of high concentration of erucic acid and glucosinlates. Newly introduced Canola cultivars with low erucic acid and glucosinolates also known as double zero, varieties made the Canola oil more popular. Besides, Canola oil has the lowest level of saturated and the highest level of mono- and poly unsaturated fatty acids which reduce cholesterol level. In Pakistan total area under Canola cultivation is 47.2 thousand tons (Anonymous 2002).

Being a newly introduced crop in the country requirements Improved varieties of Canola or hybrids are capable of giving higher yields when grown under optimum fertility level. Fertilizer application was growth parameters such as braches per plant.

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and flower per plant (Allen and Morgan, 1972; Taylor et al. 1991) and by producing more vigorous growth and developments as reflected by increase in stem length number of flowering braches, total plant weight leaf area index (LAI) and number and weight of pods and yield components decreased by increasing N and P rates but potassium fertilization had non-significant effect (Abet-E1-Gawad et al, 1990).

However, the information on yield dynamics of Canola with respect fertilizers is still lacking in Pakistan. Therefore the present study was conducted to determine the effect of different N, P and K levels on growth, seed yield and oil content of Canola under agro climatic conditions of Tando jam.

MATERIALS AND METHODS. A field study to determine the production efficiency of Canola cv. Rainbow under various applied NPK levels was conducted during 2001 at the University of Agriculture Research Institute, Quetta on a sandy loam soil with and initial fertility status of 0.04% N, 6.9 ppm P_2O_5 and 148 pm available K_2 O. The experiment was laid out in randomized complete block design with four replications having a net plot size of 3.5 x 5.0 m. fertilizer rats comprised, 60-0-0,60 -30-0,60-30-75,90-30-75, 90 -60-75, 90-60-100,120-60-75,120-60-100 and 150-90-100 kg ha^{-1}NPK respectively. Half of N and full dose of P and K were applied as a basal dose while the remaining half N was applied at flowering. Nitrogen, phosphorus and potassium were used in the form of urea, triple super phosphate and sulphate of potash, respectively. The crop was sown on March 1st, 2001 using a seed rate of 5 kg ha^{-1} and harvested on July ----, 2001. All other agronomic practices like plant population, number of irrigations weeding etc. were kept uniform and normal for all the treatments. Observations on various agronomic traits were recorded by using standard procedures.

Seed oil contents were determined by NMR (Nuclear Magnetic Resonance) Test (Robertson and Morison, 1979). Total nitrogen in seed was estimated by distillation was made with micro Kjeldahl`s apparatus (Jackson, 1964). Thereafter, protein was calculated by multiplying nitrogen content with 6.25.

The data obtained were statistically analysed using MSTAT-C (Feed and Eisensmith, 1986), technique and treatments means were compared by using the least significant difference test at 0.05 P (Steel and Torrie, 1984).

RESULTS AND DISCUSSION.

Number of pods plant^{-1}. Table 1 shows that different combinations of N,P and K had significant effect on the parameter under discussion. Maximum number of pods plant^{-1} (643.86) was recorded in T_5 treatment where nitrogen phosphorus and potassium levels used were 90-60-75 kg ha^{-1}. This treatment did not differ significantly from T_6, T_7 and T_8 which in turn differ from the rest of treatments. Minimum number of pods (364.45) was observed in T_1 (control) treatment. The higher number of pods in treatment T_5 suggest that 90-60-75 kg N, P & K ha^{-1} may be a balanced ratio of the three macro-nutrients influencing positively the parameter under discussion. These results are in line with Nielsen (1997), who reported that increasing the rate of N fertilizer increased the pod number over control treatment in Canola.

Number of seeds pod^{-1}. Table 1 indicates that highly significant differences were recorded in number of seed pod^{-1} in response to various N, P and K levels The highest number of seeds pod^{-1} (21.42) was present in the treatment where 90-60-75 kg ha^{-1} , N, P and K were used. The lowest number of seeds (15.35) pod^{-1} was found in T_1 treatment. These results are in agreement with Sen *et al.* (1977) who reported that increasing level of N not only increased the seed yield but also increased the number of pods per plant and number of seeds pod^{-1}.

1000-seed weight:- Different levels of N, P and K fertilizers had also significant effect on 1000-seed weight. The highest value of 1000-seed weight (3.32 g) was recorded in the treatment where N, P and K were applied @ 90-60 –75 kg ha^{-1} but it was statistically at par with T_6 ,T_7,T_8, and T_9 and lowest value of 1000-seed weight was noted in T_1 (control) treatment (2.82 g). The difference in mean seed weights is generally related to a short period between anthesis and maturity. At this time supply of assimilates to pods plays a crucial role in the development of seed and provably plants with greater supplies of nutrients are at

greater advantage than those under malnutrition (Scott *et al.* 1973; Allan and Morgan, 1975 and Cheema *et al.*2001).

Seed yield (kg ha^{-1}). Various fertilizer treatments exerted highly significant differences in the production of seed yield of Canola Table 1 reflects that maximum seed yield (2670.78 kg ha^{-1}) was recorded in the treatment where N, P and K were applied @ 90-60-75 kg ha^{-1}, which in turn did not differ statistically with T_6, T_7 T_8 and T_9. The lowest seed yield (1871.39 kg ha^{-1}) was given by T_1 treatment, which differs significantly from the rest of treatments. The higher seed yield in the treatment mentioned above was due to increased number of pods plant^{-1}, number of seeds pod^{-1} and 1000-seed weight. These results are in agreement with that of Billsborrow (1993) and Cheema et al. (2001) who reported that seed yield increased in response to increasing N rates up to a certain limit.

Oil Content (%). Results in table 1 show significant effect of different levels of N, P and K on oil percentage in Canola seed. Maximum oil contents (41.70%) were found in T_1 (Control) where 60-0-0 kg NPK ha^{-1} was applied. T_9 treatment (90-60-75 kg N, P and K ha^{-1}) gave significantly lowest oil content (34.60%). The higher rates of fertilizer application significantly reduced the oil contents than lower rates of fertilizers. Significant decrease in oil percentage of Canola and other oil seed crops with increasing nitrogen rates reflects the inverse relation between oil concentration and seed protein content. Many workers have reported similar results in oil seed crops (Smith et al. 1988; Zhao et al. 1993).

Protein contents:- Seed protein contents (%) of Canola were significantly affected under the influence of different levels of N, P and K as is evident from table 1. Maximum protein contents (21.50%) were recorded in T_9 (90-60-75 kg NPK ha^{-1}) treatment, which was statistically different from rest of all the treatments. The minimum protein contents (18.88%) were recorded in T_1 (60-0-0 kg NPK ha^{-1}) was applied.

These results are in agreement with the findings of Chemma et al.2001who reported that nitrogen application consistently decreased oil but increased protein contents.

TABLE-1 Yield, yield components and oil quality of canola cv. Rainbow.

Treatment Fertilizer rate kg ha^{-1}				No. of pods plant^{-1}	No. of seeds pod^{-1}	1000-seed weight (gm)	Seed Yield kg ha^{-1}	Seed oil content (%)	Protein Content (%)
	N	P	K						
T_1	60	0	0	364.45j	15.35e	2.82d	1871.39h	41.70a	18.88d
T_2	60	30	0	437.93h	16.83d	2.96c	1988.00g	41.25a	19.00d
T_3	60	30	75	497.56f	18.66c	3.10b	2226.77f	41.05a	19.06d
T_4	90	30	75	544.94e	20.84b	3.14b	2360.59e	40.29b	19.85c
T_5	90	60	75	643.86a	21.42a	3.32a	2670.78a	39.91b	19.92c
T_6	90	60	100	636.36a	21.35a	3.31a	2655.91a	40.00b	20.02c
T_7	120	60	75	633.00a	21.25a	3.30a	2639.32a	39.08c	20.56b
T_8	120	60	100	619.82ab	20.96a	3.28a	2620.66a	38.63c	20.60b
T_9	150	90	100	616.61abc	20.84a	3.24a	2612.63a	34.60d	21.50a

* Any two means not sharing a letter in common differ significantly at 5% probability level

CONCLUSION

Production efficiency of Canola crop can be enhanced when fertilized @ 90-60-75 kg ha^{-1} N, P and K under agro-ecological conditions of Tando Jam.

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