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Ratooning Rapeseed (*B. napus*): Effect on Seed Quality

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Abstract: A field experiments were conducted at NARC, Islamabad during 1988-89 and 1989-90, with Waster rapeseed (*Brassica napus* L.) to determine the effect of topping at different growth stages on seed quality. Topping treatments included an untopped check, the removal of three-quarters of the top growth at each of pre-bud, bud and first flower, as well as removal of all secondary branches at first flower. Although topping showed positive response on oil content (%) in seed in all trials which ranged 43.9 to 48.0% which appeared non significant on erucic acid and glucosinolates in the seed.

Key words: Ratooning rapeseed, seed quality

Introduction

Rapeseed has become an important crop in many countries, following the introduction of rapeseed (canola) low in erucic acid and glucosinolates (Larsen and Soresen, 1985). The Brassica oilseeds are now the third most important source of edible vegetable oil in the world (Downey, 1990).

Many nutritionists view canola as a excellent vegetable oil, one of the best on the market. Like soybean, sunflower and corn, canola oil is low in saturated fats and like all vegetable oils, it contains no cholesterol (Younts, 1990). Kramer *et al*. (1977) conclude that low erucic acid rapeseed oils (<5% C22.1) present no problem regarding growth rate and longevity. They induce no myocardial lipidosis and have no effect on heart metabolism.

The high oil content in the seeds and high protein content in the oil cake has attracted special attention to canola meal as a source to feed for poultry and monogastric animals (Jensen *et al*., 1963).

Various rapeseed constituents present in too high concentration reduce, however, the rapeseed quality (Eggum *et al*., 1985). This is especially true for glucosinolate and degradation products thereof as reported by Sorensen (1988, 1990) and Jensen *et al*. (1963).

Glucosinolates, phenolic acid (free and bound e.g in dietary fibres Bjergegaard *et al*. (1991) and their derivatives are of the greatest importance for the quality of food and feed based on glucosinolate containing plant material including oilseed rape, vegetative parts of the plants, cabbage and kale (Nielsen *et al.,* 1984; Eggum *et al*., 1985; Kozlowska *et al*., 1990; Sorensen, 1990). Older rapeseed varieties had 2 major defects. Firstly, they produced oil which contained about 45% erucic acid. a nutritionally undesirable fatty acid (Abdellatif and Vles, 1970). Secondly, the hydrolysis product of the glucosinolates in their meal had detrimental effects on animal growth thereby limiting use of the meal (Tookey *et al*., 1980).

The protein content of canola meal varies depending on the cultivars from which the meal is produced. On the average canola meal made from a mixture of low glucosinolate cultivate can be expected to contain 38 to 38% protein (Clandinin and Robblee, 1983). Generally speaking, canola meal is a richer source of minerals than soybean meal.

The purposes of this study were to determine the effect of topping *B. napus L.* rapeseed at different growth stages, on seed quality.

Materials and Methods

Field trials were established under rainfed conditions at the National Agricultural Research Centre (NARC), Islamabad during 1988-89 and 1989-90.

The *B. napus* rapeseed variety cv. Waster was used in all trials. Prior to seeding, soil samples were taken from all sites. Results of the physical and chemical analyses of the soils are presented in Table 1. The trial fields at NARC were cultivated with a sweep-typed cultivator to a depth of 10-15 cm. Fertilizer rate 90 kg/ha^{-1} of N and 30 kg/ha^{-1} of P were applied, using a modified Naeem rabi drill (Naeem and Co., Faisalabad, Pakistan) with fertilizer attachment, in bands 12-15 cm deep in rows 22 cm apart perpendicular to the direction of seeding. The fertilizer was a blend of urea and diammonium phosphate. Final preparation of the seedbed was accomplished by harrowing twice with a diamond harrow, followed by a wooden plank.

Trials were laid out in a randomized complete design with four replication during both the years respectively.

For all seeding, an Oyord plot drill (manufactured by Wintersteiger, Division Seedmech, Dimmelstrasse 9, A-4910 Ried, Austria) equipped with six openers spaced 30 cm apart, at a depth of 2-3 cm. was used. Seeding rate 5 kg/ha^{-1} was used.

Seeding was carried out in mid October in each of the trials conducted. Details of planting dates are presented in (Table 2). The sites received 33 and 17 mm prior to planting in October in 1988 and 1989 respectively. Meteorological data presented in Table 3 and 4.

Following treatments were used during the course of this study:

T.1: Check (no topping)
T.2: At pre-bud stage, topping of 3/4 top growth as the plant was elongating, having just completed the rosette stage
T.3: At bud stage, topping as for T.2 above
T.4: At first flower, topping as for T.2
T.5: Secondary branches were removed at first flower appearance

Seed samples after harvest from all ratooned crop treatments topped at different stages were subjected to quality determinations.

After laboratory analysis, the data *were* analyzed using the analysis of variance procedure and LSD ($p<0.05$) values

Table 1: Soil chemical and physical status of trial sites used in study

		National Agric. Research Centre, Islamabad							
Year	C.M. (%)	pH	NH_4- N ppm	P ppm	K ppm	Sand	Silt	Clay	Text
1988-89	1.1	7.8	12.3	5.6	101	31	33	36	cllm
1989-90	1.3	7.1	27.4	2.0	125	32	31	37	cllm

O.M = Organic matter, Text. = Texture, (c), = Clay; Cllm = Clay loam; Sacl = Sandy clay loam; Sicl = Silty clay loam

Table 2: Moisture regime and planting dates of trial sites used in the study

Year	Site	Moisture regime	Planting date
1988-89	NARC	rainfed	15 October
1989-90	NARC	rainfed	10 October

Table 3: Meteorological data for rabi seasons at the National Agricultural Research Centre, Islamabad. a. Monthly precipitation (mm)

Month	1988-89	1989-90	24-year average
Sept	-	-	-
Oct.	33.5	17.0	27
Nov.	0	2.5	20
Dec.	60.0	62.5	23
Jan.	60.3	50.0	66
Feb.	6.5	109.0	68
March	62.2	191.0	84
April	23.0	58.0	66
Total	245.5	490.0	354

**1960-1983 from Robertson (1986)

Table 4: Monthly mean temperatures (°C)

Month	1988-89			1989-90		
	Mean Max.	Mean Min.	Mean	Mean Max.	Mean Min.	Mean
Oct	29.0	12.3	20.7	30.5	12.5	21.5
Nov	24.0	6.3	15.1	24.2	6.5	15.3
Dec	17.6	2.8	10.2	18.5	5.5	12.0
Jan	15.1	1.6	8.3	17.8	4.8	11.2
Feb	16.8	2.8	9.8	16.5	5.6	11.0
Mar	21.5	8.0	14.7	21.7	8.5	15.0
Apr	28.3	10.5	19.4	29.0	13.0	21.0
May	37.0	17.7	27.3	38.5	22.0	30.2

were calculated for comparison among means (Steel and Torrie, 1980).

Results and Discussion

Effect on oil contents on seed (%): During 1988-89, the oil contents of seed (%) ranged from 44.4 to 45.5% whereas it ranged 43.9 to 48.0% during 1989-90. Although both the year it did not differ significantly but it was positively affected by ratooning as compared to check plots (Table 5). Results from this study showed that the oil content in seed were positively changed by topping.

Inanaga *et al*. (1986) reported that percentage of oil in seed was changed by cutting of all leaves and leaf shading at various stages during the period from the beginning of flowering to near maturity and increased with increase in dry matter of plant per seed.

Table 5: Effect of ratooning on oil content of seed (%), erucic acid (%) content of seed and total glucosinolates (micromoles/g) under barani (rainfed) conditions at NARC, Islamabad, 1988-89 and 1989-90

Ratooning	Oil content(%)		Erucic acid (%) (Content of seed)		Glucosinolates (micromoles/g)	
(Treatment)	88-89	89-90	88-89	89-90	88-89	89-90
Chock	44.4	43.9	4.73	1.41	26.7	32.1
Prebud	44.5	44.6	3.85	2.22	30.0	32.9
Bud	45.5	46.0	4.00	1.88	30.0	26.5
First Fl.	45.3	48.0	4.52	1.76	30.7	26.5
Sec. Br.	45.1	45.5	3.88	1.51	27.3	32.0
LSD (0.05)	ns	ns	ns	ns	ns	ns

Evans and Abdel Wahab (1983) found in winter oil seed rape in the U.K that leaf removal up to the stem elongation phase decreased the seed oil percentage.

Effect on erucic acid and glucosinolate in seed: The level of erucic acid ranged from 3.85 to 4.73% and 1.41 to 2.22% during 1988-89 and 1989-90. It reduced during first year whereas minimum increase occured in the second year but the differences appeared non significant which may have been the result of different locations each year. Parnell *et al*. (1983) showed that glucosinolates in certain new double-low varieties varied with location, but the effect of time of sowing was not examined. Concerned to the glucosinolate which ranged 26.7 to 30.7 (micromoles/g) and 26.5 to 32.9 (micromoles/g) during both the year respectively. But the ratooning did not influence on erucic or glucosinolate levels in the seed. Declining glucosinolate contents in vegetative plant parts in the course of growth were reported by McGregor and Love, 1988).

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