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Cutting Gram (*Cicer arietinum* L.): Effect on Green Fodder and Seed Yield under Rodh Kohi System of Dera Ismail Khan

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Abstract: Field experiments were conducted during 1999-2000, 2000-2001 to find out the effect of removing the top growth at different level on green fodder and seed yield of c.v. NIFA-88. Cutting of plants at ½ level appeared the best treatment with a seed yield of 4137 and 2095 kg ha^{-1}. Over the other treatments apart from 2/3 level of cutting seed yield of 3543 and 2072 kg ha^{-1} as compared to control (un-cut) treatment yield of 3201 and 1973 kg ha^{-1} both the year, respectively. The green fodder obtained according to the cutting level of plant but the said treatments also gave an additional benefit of green fodder of 4950 to 5550 and 3472 to 5347 kg ha^{-1} without involvement of any extra cost of cultivation. Plant height and number of branches per plant were influenced by cutting levels whereas pods/plant and 1000 seeds weight did not differ significantly. Increase in seed yield may be the result of bearing more number of branches and pods per plant by the said treatment, which could easily matured within the available duration. The severe cutting of ground level gave maximum green fodder both the years but lowest seed yield during 1999-2000 whereas in 2000-2001 after cutting, plant stand severely affected due to prevailing of foggy weather along with cold temperature remained in late December to mid January and later on crop completely failed to be recorded yield data.

Key words: Gram, cutting level, green fodder, yield, yield components, Rodh Kohi system

Introduction

Gram *(Cicer arietinum* L.) is the most important crop grown all over the world with respect to area and production. In Pakistan, it is grown an area of 1.10 m ha with an annual production of 0.77 mt. (Anonymous, 1997). It is used both for food and feed in Pakistan. Because of considerable high protein contents, it is given the name as "poor man meat". After cutting/topping, the re-growth or ratoon may be grown to maturity and harvested for seed. It produces enough green fodder for livestock in the Rodh-Kohi (Daman) area during autumn (December and January) when the other green grasses are not available in the areas. However livestock is the main stay of the barani farmers. They face acute shortage of fodder in winter as well as in summer. During winter the unavailability of fodder leaves the farmers with no option but to feed their animals the green crop of chickpea. To overcome the problem of green fodder shortage, various measurements are planned and undertaken in rainfed area of Pakistan. Zahid *et al.* (1997) concluded that improved production technology produced 34516 kg ha^{-1} green fodder as compared to local production technology (17321 kg ha^{-1}) which resulted an additional income of Rs.2557 ha^{-1} to the farmers. Harper and Compton (1980) found in *Brassica* crops used as a forage for autumn grazing provided an acceptable feed of high nutritive value at relatively low cost compared to conserved grass. Even and Wahab (1983) found in winter oil seed rape in the U.K that leaf removal at various stages resulted in significant seed yield reductions with lowest yields being obtained by defoliation at the beginning of stem elongation.

Gram crop giving fodder and grains to the farmers, also provide an opportunity to improve livestock production through increasing fodder quality and quantity in rainfed areas. The area farmers graze the gram crop with the concept that yield is improved but there is no yield data available to prove it. Also they don't know that to which extent and stage, crop should be grazed. Therefore this study was under taken to determine the optimum level of plant cutting for fodder and seed production in the Rodh Kohi area of Dera Ismail Khan.

Materials and Methods

The field experiments were conducted during 1999-2000 and 2000-2001 under the Rodh Kohi irrigation system at locations: Shero-Kkona 45 and at Kot-Musa 75 km away towards South from district D.I.Khan. Rodh Kohi (Hill torrential) irrigation System is unique and exists in D.I. Khan district. Heavy rains in the catchment area which extend up to Balochistan, Afghanistan, Sulaiman range, Shirani Hills, Bhittani Range, results in the water rushing

Table 1: Chemical and Physical status of the soil, where field trial was conducted

Year	Location	O.M (%)	pH	NH_4N	P (ppm)	K (ppm)	Texture
1999-2000	Shero-Kona	0.70	7.8	0.04	4.6	-	Clay loam
2000-2001	Kot-Musa	0.72	8.4	0.06	7.0	-	Silty clay loam

Table 2: Mean monthly temperature (°C) and monthly precipitation during 1999-2000 and 2000-2001

	1999-2000 Temp. (°C)				2000-2001 Temp. (°C)			
	Max.	Min.	Mean	Precip. (mm)	Max.	Min.	Mean	Precip. (mm)
October	34	18	26.0	--	34	17	25.5	--
November	29	12	20.5	--	27	10	18.5	--
December	24	4	14.0	--	23	5	14.0	29
January	19	4	10.5	7	19	4	11.5	--
February	21	6	13.5	8	21	6	13.5	--
March	27	11	19.0	5	27	11	19.0	1.5
April	36	18	27.0	--	35	18	26.5	29.0
Total:				20				59.5

* Source: AZRI, Farm

Table 3: Response of gram to different cutting level for green fodder under Rodh-kohi system during rabi 1999-2000 and 2000-2000

Treatment Cutting level	1999-2000 Green fodder Yield	1999-2000 Dry fodder Yield	2000-2001 Green fodder Yield	2000-2001 Dry fodder Yield
	(kg ha^{-1})		(kg ha^{-1})	
Check	--	--	--	--
½ cutting	4950B	905.7B	3472C	834.7C
2/3 cutting	5550B	955.0B	5347B	1169.0B
Ground level	7400A	1252.0A	7014A	1682.0A
LSD (0.05)	1726	163.5	1567	257

Table 4: Response of gram to different cutting level for yield component and seed yield under Rodh-kohi condition during rabi 1999-2000

Treatment Cutting level	Plant ht (cm)	Branches $plant^{-1}$	Pods $plant^{-1}$	Days to Maturity	1000 seeds weight (gm)	Seed yield kg ha^{-1}
Check	88.00A	1.3C	25.7	170C	173.7	3201BC
½ cutting	63.00B	3.0B	38.3	175B	175.2	4137A
2/3 cutting	61.67B	3.3B	44.3	174B	170.7	3543AB
Ground	51.33C	4.3A	53.3	177A	164.0	2357C
LSD (0.05)	7.76	0.9	NS	1	NS	878

Table 5: Response of gram to different cutting level for yield component and seed yield under Rodh-kohi condition during rabi 2000-2001

Treatment Cutting level	Plant ht (cm)	Branches $plant^{-1}$	Pods $plant^{-1}$	Days to Maturity	1000 seed weight (gm)	Seed yield kg ha^{-1}
Check	61AB	4.0B	33.0	166C	197.3	1973
½ cutting	64A	6.6A	31.0	168B	193.7	2095
2/3 cutting	49B	6.0A	31.0	171A	193.3	2072
Ground	--	--	--	--	--	--
LSD (0.05)	13	1.9	NS	1.9	NS	NS

* NS: Non significant. Figure followed by the similar word do not differ significantly

into various torrents in the foothill plains and the fields are irrigated turn by turn.

Prior to seeding, soil samples were taken from the experimental sites for analysis. Results of the physical and chemical analysis of the soils are presented in Table 1. The fertilizer level 20-50-0 NPK kg ha^{-1} was broadcast and incorporated into the soil, using a rotavator for incorporation. The gram variety NIFA-88 was planted by a manually operated single row drill on October 17 and 18th, both the years, respectively. Meteorological data are reported in Table 2.

The experiments were laid out in randomized complete block design (RCBD) and net plot size of 1.8x5 m^2 (6 rows $plot^{-1}$). The chickpea crop was cut for fodder after 50-60 days both the years after sowing at different levels, using the treatments as follows:

Cutting level
Control (check)
½ cutting of plant
2/3 cutting of plant
Ground level

Data for green fodder, plant height, pods $plant^{-1}$, maturity, seed weight and seed yield from all treatments were collected on the four central rows in each plot. Data were analyzed using the analysis of variance (ANOVA) procedure and LSD ($P< 0.05$) values were calculated for comparisons among means (Steel and Torrie, 1980).

Results and Discussion

Green fodder yield: During 1999-2000 test data showed that green and dry fodder yield was significantly influenced according to the cutting level which ranged from 4950 to 7400 and 905.7 to 1252 kg ha^{-1} but the ground level cutting of plant surpassed all the treatments by giving a green and dry fodder yield of 7400 and 1252 kg ha^{-1} whereas there was statistically no differences in green and dry fodder yield between ½ as well as 2/3 plant cutting level. Both the treatments gave the green fodder upto the extent of 4950 to 5550 kg ha^{-1}. During 2000-2001, green and dry fodder yield ranged from 3472 to 7014 and 835 to 1682 kg ha^{-1}. Similar to former year, highest green fodder obtained when the crop was cut at ground level. In this test the fodder yield increased as per cutting levels followed (Table 3).

Seed yield: Data showed significant results during 1999-2000. Seed yield from 2357 to 4137 kg ha^{-1} (Table 4). By comparing the means with one another, it was found that the lowest seed yield obtained by cutting the plants at ground level which may be the result of severe cutting of plants at ground level which could not improve due to limited crop duration left for the crop to be matured whereas ½ and 2/3 plant cutting level significantly increased the seed yield over control (un-cut plot) and also gave an additional green fodder of 4950 to 5550 kg ha^{-1} (Table 3) without involvement of any extra cost which may have been the result of rich Rodh Kohi, soil, having enough water holding capacity for plant regrowth during the season.

Plant height reduced while branches per plant increased significantly. Although pods and 1000 seeds weight did not differ significantly among the cutting treatments but generally ½ as well as 2/3 plant cutting plots had enough potential to mature the seeds in pods as observed by total seed yield as compared to severe cutting of ground level plots while the crop appeared approximately one week behind the check plot in maturity (Table 4).

The results were in line with Khan *et al.* (1997) who reported that early October sown chickpea cv. NIFA, seed yield increased with early grazing of mid December, in a field previously sown to rice. Khan *et al.* (1993) who reported in repassed that removal of secondary branches at initial flowering did not generally affect seed yield but only small amounts of fodder were obtained whereas Raut and Ali (1986) who found in mustard in India that defoliation of 50% of the lower leaves, partial detopping of 50% top growth, 45 and 60 days after sowing, or complete detopping to ground level at 45 days after sowing, all decreased seed yield considerably.

The results were also inline with Khan *et al.* (1993) found that maturity was delayed in rape seed ranging from 2-5 days for pre-bud topping, 5-19 days for bud-stages topping and 6-12 days for topping at first flower, need to be considered in view of cropping sequence demands on fields. Chand *et al.* (1975) and Khan and Chaudhary (1975) positively correlated with its components, secondary branches and number of pods per plant were the two main components of seed yield as reported by Katiyar *et al.* (1977) and Singh *et al.* (1973) through path analysis in gram.

Data during 2000-01 showed similar trend as for 1999-2000 (Table 5). Seed yield slightly improved over control when the crop plants were cut at ½ and 2/3 levels. Beside the seed improvement the said treatments additionally gave 3472 to 5347 kg ha^{-1} of green fodder concerned to seed weight and pods per plant of the said treatments did not differs significantly by among the treatments but, branches of the plants improved whereas maturity delayed 2-5 days over control (un-cut) by cutting. Crop cut at ground level gradually died after cutting due to cold injury caused by foggy weather remained continuously from late December to mid January. Therefore no yield data was recorded from this treatment.

It has been concluded from the two years study that sowing of crop in the middle of October and cutting of plant at ½ level appeared the best treatment which gave

32 to 6% more yield over control (un-cut) along with additional green fodder 3472 to 4950 kg ha^{-1} both the years respectively.

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