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Response of Sunnhemp (*Crotalaria juncea* L.) to Sowing Time and Topping for Seed Production

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A B S T R A C T

A field experiment entitled "Response of sunnhemp (*Crotalaria juncea* L.) to sowing time and topping for seed production" was conducted during *kharif* 2016 at C. P. College of Agriculture, S. D. Agricultual University, Sardarkrushinagar. The experiment consisted of four different dates of sowing and four stages of topping at different intervals. These treatments were evaluated under split plot design with four replications. Among various dates of sowing, treatment S_2 (4^{th} week of June) exhibited significantly higher plant height, branches per plant, higher number of pods per plant, test weight, seed and stalk yield, net return (25,213 ₹/ha) and benefit : cost ratio (1.97). Among various topping treatments, treatment T_2 (topping at 30 DAS) gave significantly higher number of branches per plant, number of pods per plant, test weight, seed and stalk yield, net realization (23,484 ₹/ha) and benefit : cost ratio (1.89).

Introduction

Sunnhemp (*Crotalaria juncea* L.), is cultivated as multipurpose legume especially for its fine fibre in many countries including India. The crop is also grown as a fodder crop. The genus name "*Crotalaria*" means 'rattle' and refers to the noise made by the seeds when the mature pods are shaken. Species of this genus are wide spread throughout tropical, sub-tropical and to a lesser extent temperate countries. This crop is native to India. It is known in India by various names like '*Shan*' (Gujarati) '*Sonai*' or '*San*' (Hindi), '*Sanpat*' (Bengali), '*Tag*' (Marathi), '*Vakku*' (Malayalam), '*Janumu*' (Telegu), '*Saab*' (Kannada).

Among various cultural practices, proper time of sowing is a prerequisite. Climatic factors such as temperature, duration of bright sunshine and relative humidity differs with sowing time of the crop, which ultimately influence the yield of sunnhemp and also

sowing date is a very important parameter in crop production. The optimum sowing date paves the way for better use of time, light, temperature, precipitation and other factors. Slight variation in the temperature may cause complete crop failure or low yield and productivity. It is therefore essential to adjust the sowing time such a way to provide optimum soil and atmospheric temperature required for better growth and development of the crop. Topping practice greatly influences the growth and yield attributes in sunnhemp. Apical bud pinching helps in altering the source-sink relationship by curbing the vegetative growth and hastening reproductive phase. It also helps in production of side shoots or branches thus resulting in increased photosynthetic activity and accumulation of more photosynthates ultimately resulting in increased seed size and yield.

Materials and Methods

The investigation was conducted during *kharif*, 2016 at Agronomy Instructional Farm, Department of Agronomy, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, District : Banaskantha (Gujarat). The experiment consisted of four different times of sowing and four stages of topping at different intervals and treatments were evaluated under split plot design with four replications.

The main plot treatments comprised of sowing times *viz;* 3rd week of June (S_1), 4th week of June (S_2), 1st week of July (S_3) and 2nd week of July (S_4) and sub plot treatments were comprised of topping stages *viz;* no topping (T_1), topping at 30 DAS (T_2), topping at 45 DAS (T_3) and topping at 60 DAS (T_4). The soil of the experimental field was loamy sand in texture, low in organic carbon and available nitrogen, medium in available phosphorus and potash content. Electrical conductivity (EC) was very low. Seeds were sown in the field with the spacing of 45 cm x 10 cm apart at a seed rate of 15 kg/ha and watered immediately. The crop was provided with phosphorous and nitrogen in the form of DAP and urea at the rate of 20:40:00 NPK kg/ha respectively. Standard intercultural practices were carried out as and when required. The crop was irrigated at an interval of 10-12 days. Data were recorded for various growth and yield parameters like plant height (cm), nodules per plant, dry weight of nodules per plant (mg), branches per plant, pods per plant, pod length (cm), seeds per pod and test weight (g). The crop was threshed plot wise and seed and straw yield were obtained from net plot which were converted into kg/ha and analyzed statistically. While calculating gross return, prevalent market price for sale of sunnhemp seed was taken as Rs 45/kg and price for sale of sunnhemp straw was considered as Rs 2/kg. Net return was calculated by deducting cost of cultivation from gross income and benefit/cost ratio was calculated by dividing total cost of cultivation (Rs/ha) by gross return (Rs/ha).

Results and Discussion

Effect of sowing time

The results reveal that time of sowing influenced different growth parameters significantly. Significantly higher value of growth attributes *viz*., plant height at harvest (252.3 cm) and number of branches per plant (5.1) and yield attributes *viz.*, number of pods per plant (35.0) and test weight (5.38 g) were recorded under 4th week of June (S_2) sown crop due to the availability of sufficient time and favourable environment for vegetative growth and development in case of the early sown crop as compared to delayed sowing.

Table.1 Effect of sowing time and topping on plant height (cm), number of root nodules, dry weight of root nodules, number of branches per plant, number of pods per plant and length of pod (cm) of sunnhemp

Treatments	Plant height at harvest (cm)	Number of root nodules per plant	Dry weight of root nodules per plant (mg)	Number of branches per plant	Number of pods per plant	Length of pod (cm)
Sowing time (S) (Main-Plot)						
S_1 : 3rd week of June	244.1	9.32	304.6	4.9	33.0	2.97
S_2 : 4th week of June	252.3	9.77	314.4	5.1	35.0	3.12
S_3 : 1st week of July	246.7	9.40	305.4	4.8	31.9	2.99
S_4 : 2nd week of July	172.3	9.40	301.9	4.6	30.5	3.01
S.Em ±	5.24	0.25	6.17	0.09	0.94	0.06
C.D. at 5%	16.8	NS	NS	0.29	3.01	NS
C.V.%	9.16	10.5	8.04	7.55	11.55	7.39
Topping (T) (Sub- Plot)						
T_1 : No topping	242.9	10.42	325.2	4.5	29.0	3.00
T_2 : Topping at 30 DAS	208.2	8.92	296.5	5.3	35.1	3.08
T_3 : Topping at 45 DAS	229.7	9.11	298.3	5.0	33.7	3.05
T_4 : Topping at 60 DAS	235.7	9.44	306.3	4.7	32.6	2.97
S.Em ±	2.60	0.20	4.40	0.08	0.88	0.05
C.D. at 5%	7.45	0.58	12.6	0.24	2.53	NS
C.V.%	4.54	8.50	5.75	6.96	10.81	6.20

Table.2 Effect of sowing time and topping on number of seeds per pod, test weight (g), seed yield, straw yield (kg/ha) and harvest index of sunnhemp

Treatments	Number of seeds per pod	Test weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)
Sowing time (S) (Main-Plot)					
S_1 : 3rd week of June	8.14	4.58	619	7465	7.74
S_2 : 4th week of June	8.39	5.38	797	7604	9.68
S_3 : 1st week of July	8.26	4.76	731	6597	10.05
S_4 : 2nd week of July	8.00	5.01	709	4016	15.06
S.Em ±	0.14	0.13	14.7	197	0.28
C.D. at 5%	NS	0.41	47.2	631	0.90
C.V.%	6.74	10.5	8.27	12.3	11.0
Topping (T) (Sub- Plot)					
T_1 : No topping	8.27	4.58	683	5639	11.30
T_2 : Topping at 30 DAS	8.41	5.29	784	7352	10.51
T_3 : Topping at 45 DAS	7.99	4.98	703	6407	10.44
T_4 : Topping at 60 DAS	8.11	4.88	686	6285	10.27
S.Em ±	0.11	0.12	13.1	131	0.27
C.D. at 5%	NS	0.35	37.8	377	NS
C.V.%	5.44	10.0	7.38	8.19	10.3

The results were in line with those reported by Yadav (2003) for *kharif* cowpea, Hari Ram *et al.*, (2011) in pigeon pea, Singh *et al.*, (2011) in uradbean and Awasarmal *et al.*, (2015) in greengram.

Various sowing time exerted significant effect on seed and straw yield of sunn hemp. 4th week of June sown crop recorded significantly higher seed yield (797 kg/ha) and straw yield (7604 kg/ha). Harvest index was significantly the highest in 2nd week of July (S_4) sown crop. This might be due to realization of minimum straw yield with treatment S_4 because of delayed in sowing which ultimately increased the harvest index. The results were in conformity with those of Hari Ram *et al.,* (2011) in pigeonpea, Singh *et al.,* (2011) in urdbean and Awasarmal *et al.,* (2015) in greengram.

Effect of topping

Taller plants were registered with no topping practice which might be due to the fact that plants were not topped and as such plants grew to their original height without reduction. Maximum value of number of root nodules (10.42) and dry weight of root nodules (325.2 mg) per plant were recorded with no topping (T_1).

The number and dry weight of nodules per plant considerably decreased with early topping due to suppressed shoot and root growth as the topping practices enhanced branching and checked root and shoot growth which resulted in less number and dry weight of root nodules per plant. Topping practice on 30 DAS (T_2) had recorded more number of branches per plant (5.3) since topping resulted in arresting vertical growth and stimulated shoot axillary buds and improved the side branches. The results were in accordance to the results obtained by Kandagatla (2013) in fenugreek.

Yield attributing characters *viz.* number of pods per plant (35.1), length of pod (3.08 cm), number of seeds per pod (8.41) and test weight (5.29 g) were recorded significantly higher under topping at 30 DAS. Seed yield (784 kg/ha) and straw yield (7352 kg/ha) were also recorded significantly higher under topping at 30 DAS. This might be due to topping at proper stage (30 DAS) had helped in maximum translocation of assimilates which ultimately resulted in maximum number of branches per plant and pods per plant which in turn increased the seed and straw yield. Similar results have been reported by Kumar (2010) in field bean, Kandagatla (2013) in fenugreek, More *et al.,* (2005) in Jute and Sowmya *et al.,* (2017) in fenugreek. Harvest index of sunnhemp was not affected significantly by different topping treatments.

It was recapitulated from the study that when sunnhemp was sown for seed production on 4th week of June coupled with topping at 30 DAS (S_2T_2) secured higher seed yield.

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