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Effect of Varieties and Dates of Sowing on Seed Yield of Sunhemp

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted at Agricultural Research Stattion, Amadalavalasa to identify a suitable sunhemp variety and sowing window during *Khariff* or obtaining higher yields in North Coastal Andhra Pradesh. The soil of experimental site was sandy loam in texture, medium in alkaline reaction (pH: 8.24), non-saline (EC: 0.22 dS m^{-1}), low in organic carbon (0.5%), low in available nitrogen (219.3 kg ha^{-1}), low in available phosphorus (22.18 kg P_2O_5 ha^{-1}) and medium in available potassium (268.3 kg K_2O ha^{-1}). The experiment was laid out in a split plot design with four main plot treatments, three subplot treatments and with three replications. The main treatments comprised of four dates of sowing viz., D_1: 1st may,D_2:15th may,D_3:1st june and D_4: 15th june. The sub plot treatments comprised of three varieties viz., V_1: K12 yellow, V_2: K12 black and V_3: SH 4. All the cultural practices were adopted as per the recommendations of University. The results of the experiment indicated that growth and yield of sunhemp was significantly influenced by variety as well as date of sowing. It was evident that sowing of sunhemp in North Coastal AndhraPradesh on

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15th June was optimum as it recorded shorter plant height (224.8 cm), early flowering i.e flower initiation at 80 days, 50% flowering in 91 days, higher plant population and significantly higher seed yield (2.35 q/ha) was recorded. Among the varieties tested SH 4 produced taller plants exhibited early flowering and finally recorded significantly higher seed yield (2.16 q/ha). However, plant population did not vary significantly among the varieties. Interaction between dates of sowing and varieties indicated that for seed crop K12 black and SH 4 of sunhemp can be sown between 1st june to 15th June in North Coastal Andhra Pradesh for getting higher seed yield of sunhemp as the seed yield of the above two varieties and dates of sowing were atpar.

Keywords: Crop sowing; yield of quality; green manure crop; crop growth; crop development; seed yield.

1. INTRODUCTION

Sunhemp (*Crotalaria juncea* L., Fabaceae), a native of India, is a fast growing annual crop. India is one of the largest producer of sunhemp and widely grown in states such as Uttar Pradesh, Madhya Pradesh, Orissa, Rajasthan, Bihar, Maharashtra and Gujarat etc. It is an important source of natural fibre. Traditionally its fibre is used in preparation of ropes, twines, fishing nets, tat-patties, handmade paper etc. [1]. It is widely used as green manure crop during pre *kharif* and later incorporated during puddling for rice [2]. Large quantities of drymatter will add to the soil and help to increase soil physical properties and it also add nitrogen to the soil. Divya Bhayal et al. [3] reported that the demand for sunhemp seed is increasing because of its potential benefits as green manure [4,5]. The availability of organic sources was reduced due to reduction in draft animals and also due to conversion of crop residues into organic matter. Demand for sunhemp seeds may be approximately estimated to be 2 million tones, considering green manuring possibilities in rice and sugarcane crops only with a seed rate of 20 kg ha^{-1}. The crop is more beneficial to the farmer as this crop is also belonging to legume family.

Despite having many valuable uses, the acreage under this crop has drastically reduced in past decades. The unavailability of good quality seeds is one of the important reasons for reduced popularity of sunhemp [6]. Seed is the critical input in any agricultural system and high yield of quality seed can be obtained only with improved agronomic techniques. Abundant research has been done aiming at standardization of time of sowing and suitable variety for seed production in many crops but most of the agronomic practices have still not been standardized for seed crop of sunhemp for North Coastal Andhra Pradesh. Sunhemp crop performed better in rice fallow situation in relation to growth and seed yield and it was concluded that Sunhemp crop was ideal to take up as seed production during *rabi* in rice fallow situation and the same seed may be utilized for green manuring in pre kharif season to enrich the soil fertility at farmers level.

2. MATERIALS AND METHODS

A field experiment was conducted at Agricultural Research Station, Amadalavalasa to identify a suitable sunhemp variety and sowing window during *kharif* for obtaining higher yields in North Coastal Andhra Pradesh. The soil of experimental site was sandy loam in texture, medium alkaline in reaction (pH: 8.24), non-saline (EC: 0.22 dS m^{-1}), low in organic carbon (0.5%), low in available nitrogen (219.3 kg ha^{-1}), low in available phosphorus (22.18 kg P_2O_5 ha^{-1}) and medium in available potassium (268.3 kg K_2O ha^{-1}). The experiment was laid out in a split plot design with four main plot treatments, three sub plot treatments and three replications. The main treatments comprised of four dates of sowing viz., D_1: 1st may, D_2:15th may, D_3:1st june and D_4: 15th june. The sub plot treatments comprised of three varieties viz., V_1: K12 yellow, V_2: K12 black and V_3: SH 4. All the cultural and package of practices were adopted as per the University recommendations.

Initial plant population was recorded 7 DAS m^{-2} and final population was recorded before harvesting of the crop m^{-2}. Plant height was measured from ground level to the tip of the growing point at 30, 45 DAS and at maturity and expressed in centimeters (cm). Initial flowering was recorded on the day the flowering was seen and when the population has attained flowering with 50% plant population the day will be recorded as days to 50% flowering. The sun dried produce from net plot area was threshed, cleaned and weight of the grain was recorded as grain yield. Grain yield ha^{-1} was worked out and

expressed in kg ha^{-1} after adding the yield from tagged plants.

3. RESULTS AND DISCUSSION

Plant height was significantly affected by different dates of sowing. Significantly highest plant height was recorded with 1st of may sowing (243.1 cm) and lowest was recorded with 15th june sowing. Early sowing has the advantage to grow tall and also it can also putfoth more drymatter. Further early sowing crop receives optimum amount of rainfall during the early monsoon season which is sufficient for good growth and development. Sunhemp crop also posses deep tap root system, which can withstand to moisture stress conditions during dry spells.

Three varieties of sunhemp were recorded plant height significantly. K12 black (239.2 cm) and SH 4 (230.5 cm) varieties were recorded significantly highest plant height and were atpar to each other. Lowest plant height was recorded with K12 yellow. Plant height may vary with respect to the variety as it is a varietal character.

The superiority of individual plant performance attributed to early sowing and varietal character finally led towards better growth and development of crop. The results are in conformity with the findings of Shastri et al. [7] and Tripathy et al. [8].

Initial plant population has significant influence on yield as population is directly proportional to the yield but upto the optimum population. Initial plant population during 1st may (2.62 lakhs/ha) and 15th may (2.71 lakhs/ha) dates of sowings were less due to high temperatures and insufficient moisture than the plant population on the other two dates of sowing. No significant difference in initial population was recorded between the varieties.

Days to intial flowering was significant among the dates of sowing. Late sown crop will come to flowering early (15th june) 80 days than the early sown crop (1st may) 111 days. This might be due to availability of moisture and also early sown crop has more vegetative growth than late sown crop. Significant difference in intitial flowering was recorded among the varieties. This might be due to the variation in the durations between the varieties. SH 4 recorded significantly early initial flowering (93 days) than when compare with the other two varieties.

Grain yield of sunhemp was significantly affected by different dates of sowing and in between varieties. Significantly higher grain yield was recorded with D4 (15th june) date of sowing.

Table 1. Influence of different sowing windows on plant population, plant height, inititial flowering, 50% flowering and seed yield of sunhemp

Treatments	Plant population lakhs/ha	Plant height (Cm)	Inititial flowering	50% flowering	Seed yield q/ha
Different dates of sowing					
D1 1st may	2.62	243.1	111	120	1.05
D2 15th may	2.71	235.4	100	111	1.18
D3 1st june	3.19	227.4	94	104	2.19
D4 15th june	3.19	224.8	80	91	2.35
Sed	0.04	5.4	0.4	0.3	0.04
CD (0.05%)	0.12	10.9	1.0	1.0	0.12

Table 2. Influence of different varieties on plant population, plant height, inititial flowering, 50% flowering and seed yieldof sunhemp

Treatments	Plant population lakhs/ha	Plant height in Cms	Inititial flowering	50% flowering	Seed yield Q/ha
Different varieties					
V1-K12 yellow	2.97	228.3	102	112	1.14
V2-K12 black	2.90	239.2	94	104	1.78
V3- SH 4	2.93	230.5	93	103	2.16
Sed	0.03	4.7	0.3	0.3	0.03
CD (0.05%)	0.08	9.5	1.0	1.0	0.08

Table 3. Interaction effect between the dates of sowing and varieties on seed yield of sunhemp

	Dates of sowing				
Varieties	**D1 1st may**	**D2 15th may**	**D3 1st june**	**D4 15th june**	**Mean**
V1-K12 yellow	0.84	0.89	1.25	1.57	1.14
V2-K12 black	0.88	0.88	2.68	2.68	1.78
V3- SH 4	1.42	1.77	2.63	2.81	2.16
Mean	1.18	2.19	2.35		
Sed	0.07				
CD (0.05%)	0.19				

Less the height of the plant is due to late sowing of the crop and less drymatter was produced, which will help for more partitioning of food materials to reproductive organs as illustrated by Sultani et al. [9] and Kushwah et al. [10]. Among the varieties SH 4 variety (2.16 q/ha) significantly recorded higher yield than with the other two varieties K 12 black (1.78 q/ha) and K12 yellow (1.14q/ha) respectively. Interaction effect was significant among the dates of dates of sowing and in between varieties indicated that for seed crop K12 black and SH 4 of sunhemp can be sown between 1st june to 15th june in North Coastal Andhra Pradesh for getting higher seed yield of sunhemp as the seed yield of the above two varieties and dates of sowing were atpar [11].

4. CONCLUSION

Growth and yield of sunhemp was significantly influenced by variety as well as sowing window. Sowing of sunhemp in North Coastal Andhra Pradesh on 15th june was optimum as it recorded shorter plant height, early flowering i.e flower initiation, 50% flowering, higher plant population and significantly higher seed yield was recorded.

Among the varieties tested SH 4 produced significantly higher seed yield. Interaction between dates of sowing and varieties indicated that for seed crop K12 black and SH 4 of sunhemp varieties can be sown between 1st june to 15th june in North Coastal Andhra Pradesh for getting higher seed yield of sunhemp.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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