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Effect of varieties, irrigation and nitrogen management on fibre yield of sunhemp

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ABSTRACT

A field experiment was conducted at Sunhemp Research Station, Pratapgarh, Uttar Pradesh, India to find out the effect of varieties, irrigation and nitrogen management on the fibre yield of sunhemp. The results showed no significant varietal difference on fibre yield but irrigation at 18 days interval and nitrogen @ 20 kg ha^{-1} was found to increase the fibre yield significantly.

Key words: *Crotalaria juncea*, fibre, irrigation, nitrogen

Sunhemp (*Crotalaria juncea* L.) also known as Indian hemp, Bombay hemp or Banaras hemp is grown in India over an area of 63 thousand hectare with a production of 35 thousand tonnes of fibre (Subbaiah *et al.*, 2002). It is an important multipurpose leguminous crop grown for fibre, green manure and fodder purposes. India is the largest producer of sunhemp fibre followed by Bangladesh and Brazil. In India, it is extensively cultivated in Uttar Pradesh, Madhya Pradesh, Orissa and Tamil Nadu. It plays an important role in the national economy both as raw material for indigenous industry and also as a foreign exchange earner through export. Its fibres are used for manufacturing of tissue paper and papers for currency besides making ropes, twines, nets, canvas and screens (Tat-Patty). The national productivity of sunhemp fibre is very low. It is because of lack of knowledge on fibre production technology. There is meagre exhaustive study on this crop regarding varieties, irrigation requirement and fertilizer management. Keeping this in view an experiment was under taken to find out the best variety for fibre, irrigation requirement for maximum yield and suitable nitrogen dose for higher fibre yield of sunhemp.

MATERIALS AND METHODS

The field experiment was conducted at Sunhemp Research Station (ICAR), Pratapgarh, Uttar Pradesh, during the summer seasons of 2003-04 and 2004-05 on sandy loam soil with pH 7.7, organic carbon 2.6 g kg^{-1}, bulk density 1.44 g cc^{-1}, $CaCO_3$ 7-10 g kg^{-1} and available nitrogen, phosphorus and potassium 228, 12 and 185 kg ha^{-1}, respectively. The experiment was laid out in a split split plot design with three replications. The irrigations (18, 30 and 45 day's interval) were kept in main plot, varieties (K-12 yellow, K-12 black and T-6) in sub plot and nitrogen (0, 20 and 40 kg ha^{-1}) in sub-sub plot. The crop was grown during mid April to mid July with row spacing of 20 cm. and plant to plant spacing of 5-7 cm. The recommended dose of phosphorus and potassium along with nitrogen (treatment wise) was applied at the time of sowing. Irrigation water to a depth of 5 cm was applied each time. Remaining package of practices was adopted as per the recommended package of practices. Harvesting was done at 90 days stage and retted in pond water. Fibre was extracted manually and dried in sun.

RESULTS AND DISCUSSIONS

Varietal impact

Varieties did not differ significantly with respect to yield attributing parameters as well as fibre yield (Table 1). However, maximum plant height (PH), basal diameter (BD), green weight (GW) and fibre yield (FY) were recorded in K-12 yellow.

Table 1: Effect of varieties on yield attributing parameters and fibre yield of sunhemp

Treatments	PH (cm)		BD (mm)		GW (q ha^{-1})		FY (q ha^{-1})	
Variety	**2003-04**	**2004-05**	**2003-04**	**2004-05**	**2003-04**	**2004-05**	**2003-04**	**2004-05**
K-12 yellow	256.31	250.67	12.9	11.2	278.68	266.86	6.46	6.16
K-12 black	255.41	249.67	12.8	11.1	276.80	263.27	6.43	6.09
T-6	254.30	249.22	12.7	11.2	276.12	264.83	6.42	6.12
SEm(±)	-	-	-	-	-	-	-	-
LSD(0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

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Table 2: Effect of irrigation on yield attributing parameters and fibre yield of sunhemp

Treatments	PH (cm)		BD (mm)		GW (q ha^{-1})		FY (q ha^{-1})	
Irrigation intervals	**2003-04**	**2004-05**	**2003-04**	**2004-05**	**2003-04**	**2004-05**	**2003-04**	**2004-05**
45 D I	249.83	239.74	12.0	10.3	227.42	222.78	5.24	5.12
30 D I	255.29	250.11	12.6	11.2	271.12	261.07	6.30	6.04
18 D I	260.89	259.70	13.7	12.0	333.05	311.11	7.77	7.21
SEm(±)	**1.82**	**2.98**	**0.34**	**0.27**	**11.24**	**9.51**	**0.31**	**0.26**
LSD(0.05)	**5.12**	**8.39**	**1.0**	**0.8**	**33.86**	**29.10**	**0.92**	**0.78**

Table 3: Effect of nitrogen on yield attributing parameters and fibre yield of sunhemp

Treatments	PH (cm)		BD (mm)		GW (q ha^{-1})		FY (q ha^{-1})	
Nitrogen Dose (kg ha^{-1})	**2003-04**	**2004-05**	**2003-04**	**2004-05**	**2003-04**	**2004-05**	**2003-04**	**2004-05**
Control	249.40	242.19	12.3	10.6	251.28	247.31	6.01	5.73
20	258.17	252.74	13.0	11.4	289.87	272.88	6.66	6.31
40	258.44	254.63	13.1	11.5	290.44	274.77	6.64	6.34
SEm(±)	**2.81**	**3.31**	**0.2**	**0.23**	**8.95**	**7.32**	**0.21**	**0.18**
LSD(0.05)	**8.21**	**9.80**	**0.6**	**0.7**	**26.50**	**23.12**	**0.61**	**0.54**

Effect of irrigation

Yield attributing parameters like plant height, basal diameter, green weight and fibre yield were significantly improved due to irrigation treatments during both the years (Table 2). The maximum PH, BD, GW and FY were obtained with the irrigation applied at 18 days interval. The higher fibre yield under the influence of irrigation applied at 18 days interval might be due to increased moisture content of soil which resulted into increase in turgidity of cells and better nutrient supply ultimately leading to better growth and development of crop plants. Increase in biomass production, yield attributes and yield was also reported by Sarkar (1992), De Costa *et al.* (1999) and Idnani and Singh (2008) in summer legume crops.

Effect of nitrogen

Application of nitrogen also showed significant increase in plant height, basal diameter, green weight and fibre yield during both the years. However, no significant difference was recorded between 20 and 40 kg nitrogen per hectare (Table 3). The increase in yield and yield attributing parameters due to nitrogen application is because of accelerated synthesis of carbohydrates as nitrogen is an essential constituent of photosynthetic structure of plants. Besides this, nitrogen fertilization increases the cation exchange capacity of the plant roots making them more efficient in absorbing other nutrients. The results are in agreement with the findings of Sarkar *et al.* (1998), Chaudhary *et al.* (2000), Krishna *et al.* (2001), Yakadri *et al.* (2002) and Asaduzzaman *et al.* (2008) in different summer legume crops.

On the basis of above results it was concluded that timely application of irrigation and optimum amount of nitrogen is needed to increase the productivity of sunhemp.

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