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Optimization of Safflower (*Carthamus tinctorius* L.) Production Technology under Resource Constraints

Key words : Safflower, Production constraints

Safflower in recent years gained importance due to its premium healthy vegetable oil because of its high percent linoleic acid (78%), which play a major role in reducing blood Cholesterol. India holds a premier position in oilseed area (12-13%) and production (6-7%) in the world. India ranks first in safflower production. Despite immense yield potential, the average productivity of safflower crop is 650 kg/ha and is still lagging behind the world average productivity 709 kg/ha for various reasons like poor nutrient status, insect pest and diseases (Damodaram and Hegde, 2007). The yield potential has to be elevated to a greater extent by overcoming the constraints.

Different production factors (fertilizer + thinning + plant protection + weeding) contribute towards the establishment of crop, growth of the crop and ultimately the final yield of safflower. Though the input management had been given due importance, the percent contribution or the losses due to their non availability to the safflower crop under Southern Telangana zone of Andhra Pradesh. Hence the experiment was conducted to identify the major constraints and their contribution in safflower production under rainfed conditions.

The experimental site was located at Agricultural Research Station, Tandur, Ranga Reddy (dt.), Andhra Pradesh (17^0 5^1E $77^0$$35^1$N and 553.18m above MSL and average annual rainfall of 800 mm). The experiment was conducted for two consecutive years 1998-99 and 1999-2000 during rabi season on deep black soil with PH 8.3, low in available N (195 kg/ha), medium in available P2O5 (20.4 kg/ha) and high in available K2O (280 kg/ha).

The experiment was laid out in Randomized block design with eight treatments replicated thrice on safflower variety. Gross plot size of the experiment was 4.5m x 6.0m and the net plot size was 2.7 x 3.8m. The treatments consisted of the full package and deletion one or more of inputs like fertilizer, plant protection, thinning and weeding (Table -1).

Safflower crop was sown by dibbling seed behind the plough in marked row width of 45 cm and 20cm plant to plant. A Uniform dose of 40 kg N, 40 kg P_2O_5 and 20 kg K_2O/ha through Urea, Single super phosphate and Muriate of Potash respectively was applied to the treatments. Entire quantity was applied as basal. Plant protection measures consisted of spraying of chemicals as and when the pests and disease incidence was noticed (Aphids – Dimethoate @ 2 ml /l and Rust – Mancozeb @ 2.5 g/l of water). The treatment involving thinning, thinning operation was done at 10-15 DAS leaving one plant per hill in order to maintain optimum plant stand. Weeding operation comprised of intercultivation followed by hand weeding twice at 20 and 40 DAS.

Seed yield:

Pooled data revealed that the production constraint factors resulted in significant yield reduction, which was in the order of Fertilizer>plant protection>weed control>thinning. Adoption of full package of practices produced the maximum seed yield. The yields reduced in the absence of any of the four production factors either or in combination as fertilizer + plant protection, weed control+ thinning. Fertilizer+ plant protection + weed control + thinning. Studies conducted at different centres on optimization of resource constraints also indicated the need for adoption of full package of practices to obtain the highest yield of safflower (Anonymous, 1998 and 1999).

On an average, full package of practices resulted in achieving highest yield of 1150 kg/ha which was reduced to 16.8%, 12.9%, 10.2% and 9.7% without fertilizer, plant protection, weed control and thinning respectively. The combination of different constraints further reduced the yield of safflower. Fertilizer, plant protection, thinning and weed control operations together accounted for 22.8 % yield reduction.

Table No1. Effect of different treatments on Seed yield (kg/ha) and Economics of Safflower

Treatments	Seed yield (kg ha^{-1})	Gross income (Rs ha^{-1})	Cost of cultivation (Rs ha^{-1})	Net returns (Rs ha^{-1})	Percent reduction in yield over full package	B:C ratio
	Pooled					
T1: Full package	1150	9775	4410	5365		1.2
T2: T1-Fertilizer	957	8135	3120	5015	16.8	1.6
T3:T1-Thining	1038	8823	4200	4623	9.7	1.1
T4: T1-Plant protection	890	7565	3960	3605	12.9	0.9
T5: T1-weeding	921	7829	3960	3869	10.2	1.0
T6: T1-(Fertilizer+ plant protection)	801	6809	2820	3989	10.4	1.4
T7: T1-(Weeding+ Thining)	752	6392	3750	2642	14.7	0.7
T8: Control (Without fertilizer, plant protection, weeding,thining)	490	4165	2050	2115	22.8	1.0
SEm+	40					
CD (0.05)	116					

Economics:

Economics of various treatments worked out on the basis of pooled results (Table -1) indicated that, among the various treatments, full package rendered the highest net returns of Rs. 5364 /ha, while the highest value of B:C ratio (1.6) was recorded with full package without fertilizer. It was followed by full package without fertilizer and plant protection. The treatment without fertilizer, plant protection, thinning and weeding recorded the lowest net returns (Rs.2115 /ha).The results are in conformity with the findings of O R Mishra *et al* 2005 and P.T. Patel *et al* 2003

From the above results it is concluded that adoption of full package of practices gave the highest seed yield and proved more remunerative in terms of net returns and benefit cost ratio. Among the various production constraints, fertilizer was found most crucial followed by plant protection. Weeding and thinning did not contribute more on yield of rainfed safflower in Southern Telangana region of Andhra Pradesh.

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