SHORT COMMUNICATION

YIELD ATTRIBUTING CHARACTERS AND YIELD OF SAFFLOWER UNDER RICE BASED CROPPING SYSTEM

Manish Kumar Singh and Rajendra Lakpale*

Deptt.of Agronomy, I.G.K.V.V., Raipur, Chhattisgarh - 492 006
Email: rlakpale@gmail.com

Received-06.02.2015, Revised-04.03.2015

Abstract : A field experiment was conducted during 2013 at Indira Gandhi Krishi Vishwavidyalaya, Raipur under *Alfisol* soil. Three tillage practices, zero tillage (T_1), minimum tillage (T_2) and conventional tillage (T_3) in main plot along with six irrigation and mulching treatments, no irrigation (I_1), no irrigation + mulch (I_2), irrigation at critical growth stage (branching + flowering) (I_3), irrigation at critical growth stage (branching + flowering) + mulch (I_4), two irrigation at 30 days interval (I_5) and two irrigation at 30 days interval + mulch (I_6) in sub-plot were used. Maximum yield attributing characters and yield was obtained under conventional tillage (T_3) as compared to minimum tillage (T_2) and zero tillage (T_1). The irrigation at critical growth stage (branching + flowering) + mulch (I_4) treatment was found to be the best with 1670 kg ha^{-1} and 1756 kg ha^{-1} seed yield and stover yield followed by irrigation at critical growth stage (branching and flowering) (I_3) and two irrigation at 30 days interval + mulch (rice straw) (I_6). The mulching treatments gave higher yields as compared to non-mulch treatments.

Keywords: Economics, Productivity, Yield, Safflower

INTRODUCTION

Safflower (*Carthamus tinctorius* L.) commonly named as *Kusum* or *Kardi* is a multi-purpose plant grown in India since ancient time for orange red dye extracted from its glittering florets as well as for its seed oil. It is an oilseed highly adapted to arid and semi-arid conditions. Therefore, it constitutes an interesting alternative for diversification and intensification of resources in limiting areas for other oil crops. It grows in rainfed condition and can be established as rabi crop in limited or conserved soil moisture. Movahhedy *et al*. (2009) reported that safflower is generally produced on marginal lands that are relatively dry and relatively deprived of the benefit of fertilizer inputs or irrigation.

MATERIAL AND METHOD

The present investigation was conducted under irrigated conditions during *kharif* season of 2013 at Indira Gandhi Krishi Vishwavidyalaya, Raipur under rice based cropping system. The treatments included three tillage practices, zero tillage (T_1), minimum tillage (T_2) and conventional tillage (T_3) in main plot and six irrigation + mulch practices, no irrigation (I_1), no irrigation + mulch (rice straw) (I_2), irrigation at critical growth stage (branching + flowering) (I_3), irrigation at critical growth stage (branching + flowering) + mulch (rice straw) (I_4), two irrigation at 30 days interval (I_5) and two irrigation at 30 days interval + mulch (rice straw) (I_6) in sub-plot.

RESULT AND DISCUSION

Number of heads plant $^{-1}$, head length, head diameter, no. of seeds plant^{-1}, seed and stover yield and harvest index of safflower has been presented in Table 1. Significantly maximum values were observed under conventional tillage (T_3) followed by minimum tillage (T_2) whereas significantly minimum values were recorded with zero tillage (T_1). Irrigation at critical growth stage (branching and flowering) + mulch (rice straw) (I_4) produced significantly maximum number of number of heads plant $^{-1}$, head length, head diameter, no. of seeds plant^{-1}, seed and stover yield followed by irrigation at critical growth stage (branching and flowering) (I_3) treatment and two irrigation at 30 days interval + mulch (rice straw) (I_6) whereas significantly minimum values were recorded with no irrigation (I_1) treatment. The interaction effect of tillage and irrigation + mulching treatments showed maximum yield under $I_4 + T_3$. However, it was found at par with $I_3 + T_3$ and $I_4 + T_2$, $I_4 + T_2$ and $I_6 + T_2$. Significantly minimum seed yield was obtained under $I_1 + T_1$ treatment (Table 2).

Zero tillage leads to lower temperature of topsoil, which further decreases the rate of root growth (Logsdon *et al.*, 1987) and higher soil bulk density under zero tillage and minimum tillage hinders root growth (Logsdon *et al.*, 1987). The plant height and plant population were found higher under conventional tillage (T_3) which was found at par with minimum tillage (T_2) at 30 DAS, 60 DAS as well as at harvest. Head length, head diameter, number of heads plant^{-1}, number of seeds plant^{-1} were also found higher under conventional tillage (T_3). Therefore, the seed yield was found higher under conventional

*Corresponding Author

tillage as it depends on the growth and yield attributes. Hajabbasi and Hemmat (2000) have also reported that the yield production increased with the number and depth of tillage operation. Zaman and Das (1990) have also reported that higher safflower yield was obtained on mulch application which prevents the loss of moisture from the soil and thus improves soil texture.

Table 1. Heads plant^{-1}, head length, Head diameter number of seeds plant^{-1}, seed yield, stover yield and harvest index of safflower under rice-based system as influenced by different treatments.

Treatment		Heads plant^{-1} (number)	Head Length (cm)	Head diameter (cm)	Number of seeds plant^{-1}	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index
Tillage								
T_1 -	Zero tillage	21.92	2.10	2.10	411.71	1268	2000	38.34
T_2 -	Minimum tillage	22.92	2.12	2.12	446.49	1566	2246	40.98
T_3 -	Conventional tillage	23.72	2.15	2.15	464.70	1621	2338	40.84
SEM±		0.16	0.00	0.00	0.92	5.27	21.54	0.26
CD at 5 %		0.43	NS	NS	2.54	14.64	59.80	0.72
Irrigation + Mulch								
I_1 -	No irrigation	21.50	2.11	2.11	366. 58	1120	1983	35.39
I_2 -	No irrigation + mulch (Rice straw)	21.70	2.12	2.12	373.86	1247	2012	38.41
I_3 -	Irrigation at critical growth stage (branching and flowering)	23.50	2.13	2.13	497.80	1682	2407	41.12
I_4 -	Irrigation at critical growth stage (branching and flowering) + mulch (Rice straw)	24.11	2.16	2.16	505.62	1700	2471	40.74
I_5 -	Two irrigation at 30 days interval	22.99	2.10	2.10	413.52	1539	2099	42.27
I_6 -	Two irrigation at 30 days interval + mulch (Rice straw)	23.30	2.11	2.11	488.42	1622	2196	42.40
SEM±		0.11	0.00	0.00	0.66	11.85	8.29	0.23
CD at 5 %		0.25	NS	NS	1.47	26.40	18.47	0.52

Table 2. Interaction effect of different treatments on seed yield of safflower under rice-based cropping system.

Treatment		Seed yield (kg ha^{-1})			
		Tillage			
Irrigation + Mulch		T_1	T_2	T_3	Mean
I_1 -	No irrigation	798	1229	1333	1120
I_2 -	No irrigation + mulch (Rice straw)	978	1377	1387	1247
I_3 -	Irrigation at critical growth stage (branching and flowering)	1535	1735	1776	1682
I_4 -	Irrigation at critical growth stage (branching and flowering) + mulch (Rice straw)	1564	1762	1773	1700

I_5 -	Two irrigation at 30 days interval	1362	1544	1712	1539
I_6 -	Two irrigation at 30 days interval + mulch (Rice straw)	1369	1750	1745	1622
Mean		1268	1566	1621	

	Irrigation + Mulch	**Tillage**	**Interaction (T x I)**
SEm±	11.85	5.27	13.61
CD at 5 %	26.40	14.64	31.10

REFERENCES

Movahhedy, D.M., Mohammad, M.S.S.A. and Mokhtassi, B.A. (2009). Foliar application of zinc and manganese improves seed yield and quality of safflower (*Carthamus tinctorius* L.) grown under water deficit stress. *Industrial Crops and Products* **30**: 82–92.

Logsdon, S.D., Reneau Jr., R.B. and Parker, J.C. (1987). Corn seedling root growth as influenced by soil physical properties. *Agronomy Journal* **79**: 221–224.

Hajabbasi, M.A. and Hemmat, A. (2000). Tillage impacts on aggregate stability and crop productivity in a clay-loam soil in central Iran. *Soil and Tillage Research* **56**: 205–212.

Zaman, A. (1991). Performance of safflower under limited soil moisture supply in laterite soils of West Bengal. *Bangladesh Journal of Agricultural Sciences* **18**(1): 35-38.