Environment & Ecology 29 (2) : 679—681, 2011

Nutrient Uptake by Safflower Varieties as Influenced by Irrigation Schedules and Fertility Levels in *Vertisols* of Chhattisgarh Plains

K. K. PAIKARA, A. JANGRE, N. K. CHOUBEY AND R. LAKPALE

Regional Agricultural Research Station, IGKV
Raipur 496001, Chhattisgarh, India

Abstract

The experiment was laid out in split-plot design with three replications. The mainplot consisted of four levels of irrigation schedules i.e. I_0 — No irrigation, I_1 —One irrigation at 40 DAS, I_2 —Two irrigations at 40 and 80 DAS, I_3 — 0.9 IW : CPE and two fertility levels i.e. high fertility level 120 : 60 : 60 kg NPK/ha and recommended fertility level 80 : 40 : 40 kg NPK/ha. The sub-plot treatment consisted of two varieties of safflower i.e. JSF-1 and JSI-7. The NPK content and uptake by seed, stover and their total were also found to be maximum under irrigation schedule of 0.9 IW : CPE.

Key words : Nutrient uptake, Safflower varieties, Irrigation schedules, Fertility levels.

Oil is the chief constituent of human diet. India has the dual distinction of having the highest acreage under oilseeds (19.0 million hectares). Most of the oilseed crops are cultivated in marginal and submarginal lands. Oliseeds are energy rich crops and need high energy inputs. Generally, farmers apply low input in terms of irrigation, fertilizer, pesticide and use local varieties. Oilseed production during the past 10 years has been stagnant around 10 metric tonnes except for the year 1981-82, when it touched 11.3 metric tonnes. The per capita per day basic requirement of fat and oils has been recommended to be 34-38 g (1). Safflower (*Carthamus tinctorius* L.) is an important *rabi* oilseed crop in India, which is mostly cultivated in dry region. Besides India, it is also grown in Ethopia, China, Iran, South Europe and parts of the USA. In general, safflower has 22-36% oil content which is rich in linoleic acid (75%). Person suffering from heart disorder can consume this oil and it dose not build up cholesterol in the blood. The cake particularly from decorticated seed is used as concentrated cattle feed and some times used manure. When oil is heated for two hours to 300 C and then poured into cold water it solidifies into gelatinous glass cement and fixing stones used for ornamentals (2).

Methods

The experiment was laid out in split-plot design with three replications. The main - plot consisted four levels of irrigation schedules i.e.I_0 — No irrigation, I_1— One irrigation at 40 DAS, I_2 — Two irrigations at 40 DAS and 80 DAS, I_3 - 0.9 IW : CPE and two fertility levels i.e. high fertility level 120 : 60 : 60 kg NPK/ha and recommended fertility level 80 : 40 : 40 kg NPK/ha. The sub-plot treatment consisted of two varieties of safflower i.e. JSF-1 and JSI-7. Safflower was sown on 27 November, 2003 with a seed rate of 10 kg/ha, row spacing of 40 cm and plant to plant spacing of 20 cm. The crop was harvested on 15 April 2004.

Results and Discussion

The nitrogen content in safflower seed and stover is presented in Table 1. Among the irrigation schedules, 0.9 IW : CPE gave the higher nitrogen content in seed and stover as compared to no, one and two irrigations.

The application of 120 : 60 : 60 kg NPK/ha gave significantly higher nitrogen content in seed and stover than 80 : 40 : 40 kg NPK/ha. Similarly, variety JSF-1 resulted in significantly higher N content in seed, stover and total over variety JSI-7 t.

The P content in seed and stover was analyzed at harvest (Table 2). As regards to irrigation schedules, 0.9 IW : CPE had significantly higher P content in seed, stover and total over others. The high fertility level of 120 : 60 : 60 kg NPK/ha and variety JSF-1 recorded significantly the highest P content in seed, Stover and total than their respective treatments. Simi-

Table 1. Nitrogen, phosphorus and potassium content of safflower as influenced by irrigation schedules, fertility levels and varieties.

Treatments	N content (%)			P content (%)			K content (%)		
	Seed	Stover	Total	Seed	Stover	Total	Seed	Stover	Total
Irrigation Schedules									
No irrigation	2.34	1.54	3.88	0.22	0.17	0.39	1.11	2.87	3.98
One irrigation (40 DAS)	2.41	1.65	4.06	0.26	0.19	0.45	1.14	3.27	4.41
Two irrigations (40 & 80 DAS)	2.45	1.69	4.14	0.31	0.22	0.53	1.17	3.32	4.49
0.9 IW : CPE	2.52	1.75	4.27	0.36	0.24	0.60	1.19	3.37	4.56
SE	0.002	0.003	0.050	0.002	0.003	0.005	0.002	0.003	0.005
CD (P = 0.05)	0.007	0.010	0.017	0.008	0.010	0.018	0.006	0.010	0.016
Fertility Levels (kg/ha)									
$N_{80} + P_{40} + K_{40}$	2.41	1.64	4.05	0.27	0.19	0.46	1.14	3.18	4.32
$N_{120} + P_{60} + K_{60}$	2.45	1.68	4.13	0.31	0.22	0.53	1.16	3.23	4.39
SE	0.002	0.002	0.004	0.002	0.002	0.004	0.002	0.002	0.004
CD (P = 0.05)	0.006	0.007	0.013	0.006	0.007	0.013	0.006	0.007	0.013
Varieties									
JSF-1	2.46	1.68	4.14	0.30	0.21	0.51	1.16	3.23	4.39
JSI-7	2.41	1.63	4.04	0.27	0.20	0.47	1.14	3.18	4.32
SE	0.003	0.002	0.003	0.002	0.002	0.004	0.002	0.002	0.004
CD (P = 0.05)	0.009	0.008	0.017	0.008	0.008	0.016	0.006	0.007	0.013

lar result have been also reported earlier (3, 4).

K content in seed, stover and in their total are presented in Table 1. The irrigation schedule of 0.9 IW : CPE had maximum potassium content in seed

Table 2. Nitrogen, phosphorus and potassium uptake by safflower as influenced by irrigation schedules, fertility levels and varieties.

Treatment	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)		
	Seed	Stover	Total	Seed	Stover	Total	Seed	Stover	Total
Irrigation Schedules									
No irrigation	26.89	72.40	99.29	2.51	8.01	10.52	12.71	135.02	147.73
One irrigation (40 DAS)	31.03	85.65	116.68	3.40	10.06	13.46	14.66	169.92	184.58
Two irrigations (40 & 80 DAS)	33.75	90.00	123.75	4.31	12.02	16.33	16.06	176.57	192.63
0.9 IW : CPE	36.55	95.68	131.68	5.28	12.87	18.15	17.18	183.64	200.82
SE	0.22	0.64	0.86	0.04	0.16	0.20	0.11	1.37	1.48
CD (P = 0.05)	0.67	1.93	2.60	0.12	0.49	0.61	0.33	4.16	4.49
Fertility Levels (kg/ha)									
$N_{80} + P_{40} + K_{40}$	30.85	83.25	114.10	3.49	9.76	13.25	14.57	161.73	176.30
$N_{120} + P_{60} + K_{60}$	33.26	88.62	121.88	4.26	11.72	15.98	15.74	170.85	186.59
SE	0.16	0.45	0.61	0.03	0.11	0.14	0.08	0.97	1.05
CD (P = 0.05)	0.47	1.36	1.83	0.09	0.35	0.44	0.23	2.94	3.17
Varieties									
JSF-1	32.90	88.40	121.30	4.13	11.29	15.42	15.52	169.89	185.41
JSI-7	31.21	83.47	114.68	3.62	10.19	13.81	14.79	162.69	177.48
SE	0.49	0.72	1.21	0.07	0.15	0.22	0.23	1.38	1.61
CD (P = 0.05)	1.48	2.15	3.63	0.22	0.44	0.66	0.70	4.15	4.85

and Stover and in their total which was significantly superior over no, one and two irrigations.

The use of 120:60:60 kg NPK/ha recorded significantly higher K content in seed, Stover and in their total over 80:40:40 kg NPK/ha. The JSF-1 variety gave significantly the highest K content in seed, stover and in their total.

N uptake by seed, stover and their total are presented in Table 2. The irrigation schedule of 0.9 IW : CPE recorded the highest N uptake by seed, stover and their total which was significantly superior than no, one and two irrigations.

Application of higher dose of 120:60:60 kg NPK/ha gave significantly higher N uptake by seed, stover and their total over 80:40:40 kg NPK/ha. The JSF-1 variety recorded significantly higher nitrogen uptake by seed stover and their total over variety JSI-7.

The P uptake by seed, stover and their total varied significantly due to irrigation schedules, fertility levels and varieties (Table 2). The P uptake by seed, stover and their total was the highest under the treatment 0.9 IW: CPE which was significantly superior over no, one and two irrigations treatments.

Application of higher dose of 120:60:60 kg NPK/ha resulted the highest P uptake by seed, stover and their total which was significantly superior stover 80:40:40 kg NPK/ha. The JSF-1 variety resulted significantly higher P uptake by seed, stover and their total over variety JSI-7. The irrigation schedule of 0.9 IW:CPE recorded significantly the highest uptake of K by seed, stover and their total (Table 2).

Use of 120:60:60 kg NPK/ha gave significantly higher K uptake by seed, stover and their total over 80:40:40 kg NPK/ha. Similarly, variety JSF-1 resulted significantly higher K uptake by seed, stover and their total than variety JSI-7. Similar result have been also reported by Zohra (5) and Sagare et al. (6).

References

1. Anonymous. 1985. *Oilseed production constrains and opportunities.* Oxford and IBH Publishing Pvt. Ltd., New Delhi, India. 17 pp.
2. Anonymous. 1994. *Report.* All India coord. Res. Proj. on oilseed. Direct. of Oils. Res. Rep. Rjendranagar, Hyderabad, India. 38 pp.
3. Singh U. B. and R. M. Singh. 1980. Effect of graded levels of moisture regimes, N and P fertilization on seed yield, oil content and NPK uptake by safflower *Ind. J. Agron.* 25 : 9—17.
4. Zaman A. and P. K. Das. 1991. Effect of irrigation and nitrogen on yield and quality of safflower. *Ind. J. Agron.* 36 : 177—179.
5. Zohra A. 1983. *Studies on the effect of nitrogen and phosphorus on yield and oil content of safflower.* M.Sc. (Ag.) thesis, APAU, Hyderabad (AP), India.
6. Sagare B. N., H. M. Khonde and V. A. Deshmukh. 1986. Effect of nitrogen and phosphorus level on yield, monetary return and nutrient uptake by safflower. *Punjabrao Krishi Vidha Peeth Res. J.* 10 : 96—98.