

Response of Safflower (*Carthamus tinctorius* L.) to Nitrogen and Irrigation

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Safflower, a *rabi* season oil seed crop is capable of producing good yield even on marginal land and drought conditions. It is mostly grown as dryland crop on conserved moisture, but seed yield increased by 83% at Rahuri and 188% at Jhargram with the application of 2 and 3 irrigations, respectively (Anonymous 1983-85). Application of fertilizer nitrogen has also proved beneficial in increasing the crop yield (Singh & Yusuf 1981).

A field experiment was conducted during *rabi* 1988-89 at Rajasthan College of Agriculture, Udaipur to evaluate optimum level of N under varying irrigation schedules of agroclimatic zone IVa of Rajasthan. This zone has typical sub-tropical climatic conditions characterized by mild winters and moderate summers with mean annual rainfall of 637 mm. The maximum and minimum temperature during crop season varied between 19.6 to 37.0 and 2.9 to 17.0°C with 10 mm rainfall during mid January. The soil of experimental field is clay loam, alkaline (pH 8.2) having OC 0.63%, N 0.054%, P

20.7 and K 360.3 kg ha⁻¹. The field capacity, PWP and bulk density of 0-15, 15-30 and 30-45 cm depth of soil were 26.5, 26.6 and 29.7 %, 11.5, 10.5 and 10.5% and 1.43, 1.55 and 1.58 g cm⁻³, respectively.

The treatments comprised of combination of four levels of N (0, 30, 60 and 90 kg ha⁻¹) and six irrigation schedules based on critical stages approach viz., I₀- control, I₁- one irrigation at branching, I₂ - one irrigation at flowering, I₃ - two irrigation one each at branching + flowering, I₄ - two irrigations one each at branching + grain filling, I₅ - three irrigations one each at branching + flowering + grain filling. The 24 treatment combinations were replicated thrice in RBD.

An increase in level of N upto 60 kg ha⁻¹ brought about significant improvement in capitulum plant⁻¹ and test weight over control, while seed capitulum⁻¹ showed significant improvement upto 90 kg N ha⁻¹ (Table 1). Similarly, significantly higher seed and stover yield was recorded upto 60 kg N ha⁻¹, which was statistically at par with 90 kg

Table 1 Effect of N and levels of irrigation on yield attributes and yield of safflower

Treatments	Capitulum plant ⁻¹	Seed capitulum ⁻¹	1000 grain weight (g)	Seed yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)	Oil yield (kg ha ⁻¹)
N levels (kg ha⁻¹)						
0	23.3	18.8	53.1	2026	6899	589
30	28.1	20.1	54.7	2099	7399	612
60	29.0	22.6	55.9	2323	7788	650
90	30.6	24.4	56.5	2483	8208	686
CD (0.05)	3.9	1.7	1.1	176	769	73
Irrigation levels						
I ₀	22.4	17.6	51.8	1736	6473	481
I ₁	27.7	20.5	54.1	2165	6610	631
I ₂	26.5	22.0	54.7	2073	7109	576
I ₃	29.4	23.6	56.3	2327	7958	657
I ₄	27.3	22.9	56.4	2505	7987	699
I ₅	33.2	23.9	57.1	2601	9220	760
CD (0.05)	4.8	2.1	1.4	274	940	60

N. The increase in seed and stover yields due to 60 kg N ha⁻¹ was 14.8 and 12.5% over control. The oil yield showed significant improvement upto 90 kg N ha⁻¹. The increase in seed and stover yield due to application of N appears to be on account of significant increase in sink size i.e. capitulum plant⁻¹, seeds capitulum⁻¹ and test weight (Murata 1969). The increase in seed and stover yield of safflower due to application of N has also been reported by Mahey *et al.* (1989).

Application of one irrigation I₁, two and three irrigation I₃, I₄ and I₅ significantly increased the capitulum plant⁻¹, seed capitulum⁻¹ and test weight over no irrigation. Further, two irrigations (I₄) produced significantly higher seed yield (2505 kg ha⁻¹) over control (I₀) and on irrigation (I₂) by 43.6 and 26.7% but was found at par with two irrigation applied at branching + flowering or three irrigation applied at branching + flowering + grain filling. Significantly highest stover and oil yield (9220 and 760 kg ha⁻¹) were obtained with the application of three irrigation (I₅) over respective lower levels.

The increase in seed yield can be attributed to the favourable influence of irrigation treatments on the production of yield attributes, like capitulum plant⁻¹, seed capitulum⁻¹ and 1000 grain weight. These results are in close harmony with the findings of Singh and Singh (1980).

References

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(Received July 1993 Accepted September 1993)

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Treatments	Capitulum plant ⁻¹	Seed capitulum ⁻¹	1000 grain weight (g)	Seed yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)	Oil yield (kg ha ⁻¹)
0	23.3	18.8	23.1	2128	6890	289
30	28.1	20.1	24.7	2099	7399	612
60	29.0	22.6	22.9	2373	7788	620
90	30.5	24.4	26.2	2483	8208	666
CD (0.05)	3.9	1.7	1.1	176	768	73
Irrigation levels						
I ₀	23.4	17.8	21.8	1730	6473	481
I ₁	27.7	20.2	24.1	2162	6910	631
I ₂	26.2	23.0	24.7	2073	7102	276
I ₃	28.4	23.8	26.3	2327	7328	627
I ₄	27.2	23.9	26.4	2302	7287	699
I ₅	29.2	23.9	27.1	2601	9220	760
CD (0.05)	4.8	2.1	1.4	274	248	60