GAU Res. J. 1997. 22 (2) : 122-126

Effect of Mulches and Antitranspirants on Yield Attributes, Yield and Quality of Safflower

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Major oilseed crops of the Gujarat are groundnut, sesamum and mustard. Whereas safflower is recently introduced crop. To increase the oilseed production in arid and semi-arid conditions with rainfall of scantly, uneven and irregular nature, drought telerant crop like safflower can be successively grown because of spiny nature of leaves and ability to extract moisture from deeper soil layers through its deep tap root system (Mahapatra *et al.* 1975). Any attempt to minimize the water loss should be diverted to reduction of transpiration by use of antitranspirants and mulches without adverse effect on crop growth (Yadav and Singh, 1981). With this context, the present investigation was undertaken to ascertain the effect of mulches and antitranspirants on yield and quality of safflower.

A field experiment was conducted during the *rabi* season of 1991-92 at the college farm, Gujarat Agricultural University, Navsari Campus. The soil was clayey in texture, having poor to medium drainage and good water holding capacity with pH 7.9. Total eighteen treatments consisting of combination of three mulches (No mulch, Black polythelene mulch of 50 micron thickness and paddy straw mulch @ 5 t/ha) and six antitranspirants (No antitranspirant, Phenyl Mercuric Acid (PMA) 10^{-4} m, Kaolin (8%), Atrazin (200 ppm), PMA + Kaolin and Kaolin + Atrazin) were accomodated in randomised block design with three replications. Mulches were applied 30 days after sowing, whereas antitranspirants were sprayed twice first at 60 days and second at 90 days after sowing. The safflower variety Bhima was sown in first fortnight of November 1991 and was harvested in April, 1992. Yield and yield attributes were recorded at the time of harvest. The oil content in safflower seeds was determined with the help of Soxlet apparatus by using petroleum ether as a solvent.

Effect of mulches

Various yield attributes such as heads per plant, number of seeds per head and the test weight in safflower were significantly improved by mulch treatments (Table 1) due to positive effect of mulch in conservation and availability of moisture to the crop for longer period. Such results are also obtained by Bhan *et al.* (1980) in dryland conditions.

TABLE 1

Effect of mulches and antitranspirants on yield attributes of safflower.

Treatments	Heads/plant	Seeds/head	Test weight (g/100 seeds)
Mulches			
M_0 — No mulch	17.3	23.1	5.02
M_1 — Plastic mulch	22.6	23.4	5.19
M_2 — Straw mulch	21.5	24.9	5.18
C. D. (5%)	1.5	0.8	0.09
Antitranspirants			
A_0 — Water spray	17.4	23.6	5.07
A_1 — PMA	19.1	24.2	5.08
A_2 — Kaolin	21.4	24.4	5.10
A_3 — Atrazin	20.0	23.9	5.17
A_4 — PMA + Kaolin	22.0	25.6	5.17
A_5 — Kaolin + Atrazin	22.0	25.0	5.19
C. D. (5%)	2.1	0.1	NS
Interaction	NS	NS	NS
C. V. %	10.6	4.8	2.62

Effect of antitranspirants

Spraying of various antitranspirants alone or in combination found effective in improving different yield attributes in safflower as compared to control (Table 1). Application of PMA + Kaolin and Kaolin + Atrazin increased the seeds per head by 5.92 and 8.21 per cent, respectively over control. Dalvi *et al.* (1991) also observed similar trend in chickpea. Likewise, application of Atrazin and Kaolin alone or in combination increased the number of heads per plant significantly over control. Sebale and Khuspe (1986) also observed similar results in groundnut. Antitranspirants check the water loss from the plant leaves by reducing transpiration through stomata closer. Reduction in transpiration due to Kaolin is reported to be due to increase in reflectivity of the incident radiation, especially in visible region (Patel and De, 1976). The stomatal closer induced by Phenyl Mercuric Acetate (PMA) also reduces the transpiration. Due to this positive effect of Kaolin and PMA the

TABLE 2

Interaction effect of mulch x antitranspirant on seed yield, oil content and oil yield of safflower.

Mulches	*Antitranspirants*						
	A_0	A_1	A_2	A_3	A_4	A_5	*Mean*
			Seed yield (q/ha)				
M_0	10.50	11.25	12.71	12.29	12.64	12.11	11.92
M_1	13.60	15.31	16.63	15.88	20.80	16.83	16.51
M_2	13.93	13.00	15.92	15.30	16.74	16.24	15.20
Mean	12.68	13.19	15.09	14.52	16.72	15.06	
	Mulch		Antitranspirant			Interaction	
S. Em. ±	0.28		0.28			0.68	
C. D. (5%)	0.80		1.13			1.96	
			Oil Content (%)				
M_0	33.54	33.71	33.06	32.63	32.99	32.24	33.19
M_1	32.52	32.75	32.26	33.12	33.45	32.67	32.96
M_2	32.86	33.27	33.47	33.35	33.14	33.24	33.24
Mean	32.97	33.25	33.26	33.04	33.19	33.08	
	Mulch		Antitranspirant			Interaction	
S. Em. ±	0.05		0.07			0.12	
C. D. (5%)	0.14		0.20			0.36	

Mulches	Antitranspirants						
	A_0	A_1	A_2	A_3	A_4	A_5	Mean
			Oil yield (q/ha)				
M_0	3.51	3.79	4.20	4.01	4.17	4.02	3.93
M_1	4.42	5.02	5.54	5.26	6.96	5.55	5.46
M_2	4.58	4.32	5.33	5.13	5.55	5.42	5.04
Mean	4.16	4.38	5.02	4.80	5.56	5.00	
	Mulch		Antitranspirant			Interaction	
S. Em. ±	0.09		0.13			0.22	
C. D. (5%)	0.26		0.37			0.64	

number of heads per plant and seeds per head were found increased in safflower. However, antitranspirant application did not influence the test weight in safflower significantly.

Interaction effects

The combined effect of mulch alongwith antitranspirants was found significant for seed yield in safflower (Table 2). Outrightly the highest seed yield (20.80 q/ha) was recorded with application of PMA + Kalolin alongwith black polythelene mulch, followed by Kaolin + Atrazin with black polythelene mulch (16.83 q/ha). The increase in seed yield was double than the absolute control (10.50 q/ha). In many other treatment combinations, use of black ploiythelene or paddy straw mulch increased the seed yield considerably, particularly when accompanied with spray of antitranspirants due to positive effect of mulches and antitranspirants. Yadav and Singh (1981) also reported that daily ET was reduced significantly with reflecting type of antitranspirants.

The quality of safflower in terms of oil yield was also appreciably improved by combined effect of mulches and anti-transpirants compared to absolute control (Table 2). Significantly the highest oil yield (6.96 q/ha) was recorded with application of PMA + Kaolin alongwith plastic mulch due to higher seed yield and better oil content. The increase in oil yield with spraying of antitranspirants in sunflower was also obtained by Mungse and Bhapkar (1979). The oil content in safflower seeds was not improved much with combined effect of mulches and antitranspirants and maximum oil content (33.54%) was registered with absolute control.

(Received on 22nd April, 1996)

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