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## Effect of Spraying Maleic Hydrazide on the Growth, Date of Flowering and Pollen Sterility in Sorghum Variety CS 3541, Male Parent of CSH 5 Hybrid\*

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The effect of spraying maleic hydrazide at three concentrations viz., 500, 1000 and 2000 ppm on the 15th, 30th and 45th day after sowing in CS 3541, male parent of CSH5 Sorghum hybrid, either once or twice was observed on plant height, number of leaves, diameter of culm, area of 4th leaf, days to panicle emergence, panicle length and pollen sterility. It was found that with increase in the concentrations of the chemical, significant reductions in height of plant, area of 4th leaf and length of panicle were observed. Spraying on the 5th day as against 30th or 45th day reduced the height, leaf number, culm diameter, leaf area and panicle length to the maximum. Spraying on 45th day, at 2000 ppm delayed the flowering by 8.83 days but the pollen fertility was reduced by 32.71 per cent whereas, at 500 ppm, flowering was delayed by 4.66 days with no ill-effects on pollen fertility.

In sorghum, non-synchronised flowering in the parental lines is the problem for hybrid seed production. Many a time, the seed yields have gone down considerably due to this factor alone. To overcome this, spraying of growth regulators such as Maleic hydrazide on the early flowering line is suggested as one of the methods. The feasibility of this method under Coimbatore conditions was studied with CS 3541, the male parent for CSH 5 hybrid sorghum.

### MATERIAL AND METHODS

The experiment was conducted during Kharif season, 1976 with variety CS 3541 in the field adopting randomized block design with three replications.

The experimental plot was thrown into ridges and furrows of 3.6 metres length and 90 cm apart. Each row was taken as a replication. On one side of the ridges seeds were sown at 30 cm apart. The recommended package of practices was followed for raising the crop. Maleic hydrazide (MH) at three concentrations viz., 500 (C1), 1000 (C2) and 2000 (C3) ppm was sprayed once (SP1) or twice (SP 2) as the case may be either on the 15th (St 1) or 30th (St 2) or 45th (St 3) day after sowing. In case of SP 2 treatments, the second spraying was done 10 days after the first. A control Plot (Co) was maintained without spraying. Spraying was done with an automizer till all the foliage of the plant got wetted uniformly. A few

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drops of teepol was added to the spray fluid to act as wetting agent. While spraying, screens were provided on all sides of the plot to arrest spray drift. In each replication, ten plants were marked at random and observations were recorded on height, number of leaves; diameter of culm, and area of the 4th leaf as on 75th day after sowing, number of days to panicle emergence

pollen sterility and length of panicle at maturity.

## RESULTS AND DISCUSSION

With increase in the concentration of the chemical, there was progressive reduction in height. In C3, 13.62, 11.96 and 7.10 per cent reduction over Co, C1 and C2 respectively was observed.

TABLE I. Effect of Maleic hydrazide on different characters of CS 3541 sorghum

	Sp1			Sp2		
	St1	St2	St3	St1	St2	St3
Height (cm) (CO=106.4)						
C1	107.7	106.9	109.8	87.7	106.3	109.8
C2	106.3	97.5	103.5	84.7	97.5	111.5
C3	106.2	96.6	101.7	54.5	92.0	110.0
Leaf number (CO=10.5)						
C1	10.0	9.8	10.5	9.2	10.3	10.2
C2	10.0	9.9	10.7	9.1	10.3	10.5
C3	9.7	10.4	10.1	8.5	10.0	10.6
Culm diameter (cm) (CO=2.29)						
C1	2.3	2.4	2.4	2.0	2.4	2.3
C2	2.1	2.2	2.3	1.8	2.3	2.1
C3	2.0	2.4	2.1	1.8	2.4	2.4
Leaf area (cm <sup>2</sup> ) (CO=310.6)						
C1	243.0	280.1	290.4	257.7	245.1	360.5
C2	235.9	218.7	295.7	110.8	203.9	356.5
C3	183.7	211.3	317.7	50.5	193.1	240.7
Days to panicle emergence (CO=61.3)						
C1	63.0	62.3	65.7	64.7	65.0	63.7
C2	62.0	62.0	65.3	63.7	64.3	70.0
C3	65.7	60.0	66.3	63.0	70.3	69.3
Pollen fertility (%) (CO=93.7)						
C1	91.0	83.5	91.6	94.9	90.7	74.6
C2	74.8	80.0	85.1	80.0	73.9	—
C3	86.6	86.9	61.0	69.7	70.2	—
Panicle length (cm) (CO=22.4)						
C1	21.4	18.6	19.1	18.1	21.7	23.6
C2	20.1	19.1	22.2	15.6	22.4	20.1
C3	21.1	17.7	18.8	6.6	14.6	17.1

SP 2 reduced the height by 9.07 cm over SP 1. The stages were on par in SP 1 while in SP 2, maximum reduction was observed in St 1 (28.74 per cent) followed by St 2 (7.20 per cent). In St 3, an increase of 3.94 per cent over Co was recorded. MH according to Salisbury (1957) inhibited flowering at concentrations at which a general inhibition of vegetative growth also occurred. In the present study, reduction in plant height was found to be influenced not only by the number and concentration of spraying but also on the stage of the crop as reported in *Chrysanthemum* and *Petunia* (Sen and Sen, 1968).

The percentage of reduction in the number of leaves over the control was maximum in C3 (6.27) and minimum in C2 (4.37). The number in SP 2 was always less than in SP 1. In SP 1, St 1, St 2 and St 3 were on par. In SP 2, St 1 recorded the maximum reduction (15.20 per cent) followed by St 2 (3.32 per cent). St 2 and St 3 were on par. Bose and Hamner (1960) and Srinivasan (1962) have reported similar results in tomato. Earlier the spraying, the more was the reduction in the leaf number which is in agreement with the results reported by Mericle *et al.* (1955).

With regard to culm diameter, a reduction of 6.55 and 4.37 per cent respectively was recorded in C2 and C3 over Co. SP 2 reduced the diameter by 3.13 per cent over SP 1 and in both, St 1 recorded the maximum reduction of 7.42 and 18.78 per cent respectively. St 1 and St 3 were on par in SP 1, while St 3 and St 2 were *on par* in both PS 1 and SP 2. Narayanaswami (1960) and Bose and Hammer (1960) and Srinivasan (1962)

in tomato and Chakravarthy and Sircar (1971) in Jute reported similar results.

The leaf area ranged from 50.51 (C3 Sp 2 Sp 1) to 360.45 (C1 Sp 2 Sp3) cm<sup>2</sup>. C3 induced the maximum reduction of 35.76 per cent over Co followed by C2 (23.74 per cent). C1 and C2 were on par with Co. C2 was on par with C3. Both in Sp 1 and Sp 2, St 1 recorded the maximum reduction (28.88 per cent and 55.04 per cent respectively) followed by St 2. In Sp 1, St 1 and St 2 were on par. Both in Sp 1 and Sp 2, St 2 and St 3 were on par. Cumming (1959) reported spraying MH reduced the size of red clover leaves.

Plants sprayed with 1000 or 2000 ppm at St 3 did not develop the reproductive parts and reached maturity. Cumming (1959) reported absence of fully developed inflorescences in red clover. The maximum increase in the days to panicle emergence was recorded in C3 (4.45 days) followed by C2 (3.23 days) over Co. Sp 2 delayed panicle emergence by 2.41 days over Sp 1. In Sp 1 maximum increase of 7.26 per cent was recorded in St 3 followed by St 1 (3.64 per cent). St 1 and St 2 were on par and similarly St 1 and St 3. In Sp 2, St 3 recorded the maximum increase of 10.34 per cent followed by St 2 (8.53 per cent). The number of days to panicle emergence was the maximum (70.33) in C3 Sp 2 St 2 and minimum (60) in C3 Sp 1 St 2.

Spraying delayed the flowering also. Campbell and Freisen (1959) reported similar results in grasses. With an increase in the concentration of the chemical, the number of days to flowering

TABLE II. Analysis of variance for different characters

Sources	D.F.	Variance										
		Height of plant	Number of leaves	Diameter of culm	Area of 4th leaf	Number of days to panicle emergence	Length of panicle	SED	CD	SED	CD	
R	2	121.69	0.59	0.070	2950.30	4.55	7.01	—	—	—	—	
C	3	424.15**	0.42	0.075	24120.64	20.78*	83.24**	—	—	—	—	
SP	1	1110.85**	1.10	0.082	11064.78	78.24**	54.82	—	—	—	—	
C x Sp	2	163.80	0.05	0.045	9681.58	9.47	72.88*	—	—	—	—	
St within Sp	4	1451.30**	3.25*	0.366**	44771.20*	39.19*	69.15**	—	—	—	—	
C x St within SP	8	147.95	0.28	0.024	4943.28	15.91*	8.21	—	—	—	—	
Error	36	91.71	0.38	0.043	5348.01	5.86	14.03	—	—	—	—	
Comparison between	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD
Number of sprayings	1.843	5.286	—	—	—	—	0.466	1.336	—	—	—	—
Stages of spraying	3.192	9.156	0.0205	0.587	0.069	0.199	24.377	69.920	0.807	2.868	1.249	3.581
Control & concentrations	5.972	12.112	—	—	—	—	45.605	92.495	1.510	3.062	2.336	4.738
Concentrations	2.257	6.474	—	—	—	—	17.236	49.441	0.570	1.637	0.883	2.533
Concentrations and stages of spraying	—	—	—	—	—	—	—	—	1.398	4.009	—	—
Concentrations and number of sprayings	—	—	—	—	—	—	—	—	—	—	1.249	3.581

\* Significant at 5 per cent level

\*\* Significant at 1 per cent level

was also increased. Spraying on 45th day after sowing induced the maximum delay than spraying on 15th or 30th day. Spraying at later stages of plant growth was reported to delay flowering in rice (Sen and Bose, 1959) whereas in maize, Josephson (1951) reported that applications just prior to tasselling had very little effect compared to those when the plants were 2 to 3 feet high.

Significant interaction between concentrations and stages of spraying indicated, the concentrations employed were not equally effective at different stages tried. Concentrations of 1000 and 2000 ppm were found to be the most effective when sprayed respectively on 45th and 55th day and 30th and 40th day. Hoaglund *et al.* (1953) have reported similar interaction in spring wheat.

Plants in C1 SP 2 St 3 and C2 SP 2 St 3 were totally pollen sterile, while in others the sterility ranged from 5.1 (C1 SP 2 St 1) to 39.0 (C3 SP 1 St 3) per cent. Josephson (1951) in maize and Banks (1971) in groundnut reported induced sterility through spraying of MH.

Maximum reduction of 28.55 per cent in panicle length was recorded in C3 followed by C2 (11.04 per cent). Co, C1 and C2 were on par. The length in SP 1 was on par irrespective of the stages while in SP 2, St 1 induced the maximum reduction (39.72 per cent) followed by St 2 (11.56 per cent) over Co. In SP 2, St 2 and St 3 were on par. SP 1 and SP 2 were on par both in C1 and C2, while in C3, SP 2 significantly reduced the length (6.41 cm) over SP 1. The length of panicle in SP 1 was on

par irrespective of the concentrations while in SP 2, C3 reduced the length to the maximum of 49.90 per cent over Co. C2 and C1 were on par. The length varied from 6.60 (C3 SP 2 St 1) to 23.60 (C1 SP 2 St 3) cm. Decrease (Sen and Bose, 1959) and increase (Misra and Sahu, 1956) in the length of rice panicle have been reported due to MH treatments.

Josephson (1951) in maize and Ram Kumar *et al.* (1968) in Sorghum have indicated the usefulness of this chemical as a potential tool to delay flowering in the early flowering parental lines. Under Coimbatore conditions, CS 3541 was found to flower earlier than the female line when sowings were taken up in the months of January, February, March, April, May, October and November, (Krishnaswamy, 1977). Therefore, to have synchrony in flowering of the parental lines to the maximum extent, spraying of MH at 500 ppm may be taken up by which treatment about 5 days delay be induced without any loss in pollen productivity.

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