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Effect of defoliation on maturity behavior and seed cotton yield in cotton

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ABSTRACT : The experiment on effect of defoliant Thiadiuron 36 per cent SC+Diuron 18 per cent SC and Ethral on yield, synchronization, and earliness was conducted at Central Institute for Cotton Research, Regional Station Sirsa, during 2012 and 2013 in split split plot design using the variety F 1861 and *Bt* hybrid MRC7017 as main treatment, 4 treatment of defoliants as sub treatment and 2 intervals as sub-sub treatment. Significant reduction in plant height was observed with even the lower concentration of Thiadiuron and with Ethral 2000 ppm as compared to control. On fifteenth day after spray the leaves shedding (51.3 %) and (45.6%) than in control (26.1%) and number of opened bolls/plant 38.5 and 34.4 than control 29.4 were significantly higher even with lower concentration of Thiadiuron and Ethral 2000 ppm respectively. At this stage because of uniform and early opening of bolls significantly higher yield (23.48 q/ha) and (20.78 q/ha) was obtained as compared to control (19.73 q/ha) with even lower concentration of Thiadiuron 200 ml/ha and etharal respectively. Due to synchronization and earliness of boll opening, the defoliants application is helpful in mechanical picking of cotton crop and also in preponement of wheat sowing there by also improving wheat productivity.

Key words: Cotton, defoliation, boll maturity, mechanical picking, yield

Cotton is an important commercial crop which occupies a prime position in agro industrial economy in India. In North Zone most of the cotton cultivars produce huge foliage even at the time of crop maturity which delay in opening of bolls and resulted in unsynchronized boll opening. The multiple pickings require more expenditure and is also time consuming because of dependence of labors. The availability of labors and picking cost is also a serious problem of this zone. Most of the farmers of the zone uproot the cotton in second week of November for timely sowing of the wheat and in this situation the unopened bolls can not contribute to final seed cotton yield. These problems can be solved by introduction of mechanical picking in cotton cropping system. For mechanical picking, it is necessary to shed the leaves artificially through application of defoliants which will also synchronize boll opening. It will help in timely vacation of the field for next crop and also minimize the cost of picking. Several chemicals which contain ethylene help in leaf drop, synchronous and early boll opening due to full exposure to sunlight. It makes cotton ready for single picking by machine (Bange *et al.*, 2008).

The defoliating too late or early can negatively affect the yield due to presence of higher number of late season immature bolls. However in Pakistan, the seed cotton yield was greater in the plots where defoliant was applied at the time of 60 per cent boll maturity (Awan *et al.*, 2012; Darrin and Daniel 2014). At present there is no recommendation for defoliants in North India, hence the present study was conducted with the aim to identify the suitable defoliant and their time of application.

MATERIALS AND METHODS

The field experiment on effect of defoliant Thiadiuron 36 per cent SC+Diuron 18 per cent SC on yield , synchronization, and earliness was conducted at central Institute for Cotton

Research, Regional Station Sirsa, during 2012 and 2013 with 3 replications in split-split plot design with plot size for each treatment 6.75 x 5.40 m^2. Two genotypes variety F 1861 and *Bt* hybrid MRC7017 were kept as main treatment, where as four treatment i.e. defoliant Thiadiuron (36%) SC+Diuron (18% SC) 200 ml/ha and 225 ml/ha of, ethral 2000 ppm and control were taken as sub treatment and the two intervals of application *i.e.* 140-145 DAS and 150-155 DAS as sub sub treatment. The crop was raised using recommended agronomic and plant protection measures. The data on seed cotton yield/ha at 15 days after the spray and also on complete maturity, 35th days of it were recorded. The data on boll weight, number of opened bolls, monopodia, number of sympodia, earliness, fibre properties as well as percent defoliation were also recorded. Data were subjected to statistical analysis using split-split plot design.

RESULTS AND DISCUSSION

Significant difference between the cultivars used for study were observed for various parameters. The number of sympodia, number of opened bolls/plant at 15 days after spray as well as open bolls at the time of normal harvest, boll weight, defoliation (%) yield after 15 days of spray, and at the time of last picking (180 DAS) and 2.5 per cent span length were significantly higher in MRC7017 where as the uniformity ratio was higher in F1861. The differences were non significant for other traits (Table). Significant reduction in plant height was observed with application of defoliants. The reduction was up to 120.3 cm with Thiadiuron (36% SC)+Diuron (18% SC) @ 200 ml/ha and up to 121.0 cm with Ethral 2000 ppm as compare to 126.1 Cm in control. The spray intervals of defoliants did not significantly affect the plant height. As per observation, immediately after application of the defoliants the green leaves showed shedding symptoms and on fifteenth day after spray the leaves shedding was observed significantly higher in both concentrations of Thiadiuron (51.3, 51.5 %) and Ethral (45.6%) than in control (26.1).

The useful effect of defoliants was the synchronization of maturity to adopt mechanical picking and also to the earliness in boll opening for timely vacation of the field. With in 15 days of

Table 1. Effect of Thiadiuron 36 per cent SC+Diuron 18 per cent SC on cotton

Parameters	Plant height (cm)	Mono-podia /plant	Sym-podia /plant	Green bolls /plant	Opened bolls/ plant (at 15th day of spray)	Opened bolls/ plant (at 35th day of spray)	Defoliation at 15th day of spray (%)	Boll weight (g)	Yield q/ha 15th day of spray (%)	Yield q/ha 35th day of spray (%)
MRC 7017	120.8	2.7	15.1	0.40	43.2	47.88	52.5	3.34	23.88	25.75
F1861	120.5	3.4	12.6	0.46	40.3	44.40	45.2	3.02	21.21	23.51
CD(P=0.05)	NS	NS	1.00	NS	1.4	2.60	3.4	0.18	0.64	0.80
Thiadiuron	120.3	3.2	13.4	0.22	38.5	45.87	51.3	2.95	23.48	24.13
3 6per cent SC + Diuron18 per cent SC 200 ml/ha										
Thiadiuron	119.7	2.7	14.0	0.15	39.4	45.97	51.5	3.26	23.79	24.99
36 per cent SC + Diuron18 per cent SC 225 ml/ha										
Ethral 2000 ppm	121.0	3.0	13.6	0.06	34.4	46.17	45.6	3.21	20.78	24.38
Control	126.1	3.5	14.5	1.28	29.4	46.57	26.1	3.28	19.73	24.11
CD(p=0.05)	5.00	NS	NS	0.34	2.6	NS	10.6	NS	0.91	NS
140-145 DAS	119.3	3.2	13.6	0.52	39.2	46.03	49.6	3.15	22.28	24.34
150-155 DAS	121.9	3.1	14.1	0.34	38.4	46.25	50.2	3.21	22.82	24.92
CD(p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2. Effect of Thiadiuron (36% SC)+Diuron (18% SC) on fibre properties

Parameters	Seed index (g)	Ginning outturn	25 per cent span length (mm)	Uniformity ratio value	Micronaire value strength	Bundle strength
F1861	9.2	35.6	25.7	49	4.6	21.2
MRC 7017	9.5	35.4	28.5	47	4.8	21.4
CD	NS	NS	1.7	1.5	NS	NS
Thiadiuron	9.1	35.7	28.5	45	4.7	21.2
36% SC+Diuron 18% SC 200 ml/ha						
Thiadiuron	9.3	35.6	28.4	46	4.6	21.3
36% SC+Diuron 18% SC 225 ml/ha						
Ethral2000 ppm	9.6	34.4	28.3	45	4.6	21.6
Control	9.4	35.3	28.5	45	4.8	21.2
CD	NS	NS	NS	NS	NS	NS
140-145 DAS	9.2	35.5	28.3	45	4.8	21.5
150-155 DAS	9.5	35.5	28.4	46	4.7	21.4
CD	NS	NS	NS	NS	NS	NS

spray, significantly higher numbers of opened bolls were observed in the plots sprayed with two concentration of Thiadiuron (38.5 and 39.4) and also with Ethral (34.4) than control (29.4). At this stage most of the bolls in sprayed crop uniformly opened which resulted in significantly higher yield (23.48 and 23.79 q/ha) in Thiadiuron sprayed crop with concentration of 200 ml and 225 ml/ha and with Ethral (20.78 q/ha) as compared to control (19.73 qt/ha). However, the effect of spraying intervals was non significant on yield (Table1). Advancement in opening of bolls with use of Thiadiuron and Ethral without any adverse effect on fiber strength and lint (%) was also reported by some researchers (Awan *et al.* 2012; .Rajni *et al.* 2011; Buttar and Singh 2013). At last stage of picking at 180 DAS, in unsprayed crop also, all the bolls opened naturally and based on picking at this stage the difference for yield recorded non significant between the sprayed and non sprayed crop. The use of different defoliants and intervals of their application did not significantly affect the seed index and ginning outturn. The non significant effect of use of defoliants on important fiber property such as 2.5% span length (mm), uniformity ratio, micronaire value and bundle strength was observed (Table 2).

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