

## Preliminary Studies on Yield, Earliness and Boll Weight by the use of Chemical Defoliants on MCU. 1 Cotton\*

by

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**Synopsis:** The effect of chemical defoliants on the yield, earliness and boll weight of MCU. 1 cotton is reported in this article.

**Introduction:** Artificial defoliation of cotton was first discovered at the Pee Dee Agricultural Experimental Station in South A Carolina, U. S. A. While applying calcium cyanamide as a fertiliser, some of the chemical accidentally fell on the leaves, which caused leaves to drop. With the use of mechanical harvesters for picking cotton in the U. S. A. and the U. S. S. R., the real value of defoliating cotton was fully realised. In India, however, picking is done by hand and hence the necessity of defoliating is hardly felt. However, it is claimed that defoliation has definite advantages in hand picking methods also. Hence a trial was made with the defoliant calcium cyanamide, and a desiccant Pentachlorophenol.

**Review of Literature:** Cardozier (1957) has enumerated the advantage of defoliation. Mechanical harvesters can do a better job of picking. Defoliation reduces green stain, fetching better price. It helps better penetration of sun light and even the lower most bolls get good exposures and rotting is prevented. Boll opening is hastened resulting in earlier arrivals in the market. Per capita quantity of picking is enhanced and the trash content is considerably reduced. Defoliation helps in the reduction of the insect population. Observations in Russia and the United States of America with cotton showed that defoliation with calcium cyanamide hastens boll maturity and reduces the number of pickings. The National Cotton Council of the United States in 1950 has also recommended the use of this defoliant to induce defoliation and earliness, enhance the efficiency of picking and act as a control on carry over of pests and diseases. In Russia defoliation is reported to induce development of large-sized bolls. Sikka and Avtar Singh (1961), the Indian delegates to the U. S. S. R., report that magnesium chlorate is also used for defoliation when sprayed at a dose of 6-8 kg. per acre in 120 litres of water. They also report that defoliation hastens boll maturity and opening and reduces trash content.

Cardozier (*loc cit*) reports wide use of desiccants also. Desiccants cause death of the leaves soon after application and the leaves remain attached to the plants. Pentachlorophenol is one of the best known desiccants in the U. S. A. This was also included in the study.

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No work of this kind has so far been reported in India on cotton.

**Materials and Methods:** A preliminary trial to study the effects of the chemicals, calcium cyanamide and pentachlorophenol, in inducing earliness in harvest and on boll weight was conducted at the Cotton Breeding Station, Coimbatore during 1962-63 season. The strain used was MCU.1. The following treatments were adopted under a randomized block design.

1. Calcium cyanamide at 40 lb. per acre.
2. Calcium cyanamide at 45 lb. per acre.
3. Calcium cyanamide at 50 lb. per acre.
4. Pentachlorophenol at 1 lb. per acre.
5. Pentachlorophenol at 2 lb. per acre.
6. Hand clipping of leaves.
7. Control (untreated).

The crop was sown on the 28th August 1962. The chemicals were applied once on the 126th day after sowing, when the crop was fully mature and slight cracking of green bolls was observed. Since calcium cyanamide was not soluble in water, dusting of the chemical was done on the leaf surface and a fine spray of water was given in order to allow the chemicals to settle on the leaf surface. An emulsifiable form of Pentachlorophenol was mixed in water to arrive at a concentration of 0.1% and 0.2%. A spray volume of 100 gallons was adopted. The applications work out to 1 and 2 lb. of Pentachlorophenol per acre respectively.

Observations on boll index was recorded by working out the number of bolls whose *kapas* would weigh one pound. Bartlett's earliness index (1961) was worked out to assess the effect of the treatment on earliness.

**Results:** In the plots treated with calcium cyanamide, the leaves showed a cupped appearance in 24 hours accompanied by a light coating of white crust on the surface. The leaves turned copper brown from 48 hours onwards, gradually drying up. In about 6 days, the leaves abscised at the node and began to drop. Defoliation was completed in about 10 days. The sympodial branches at the higher nodes of the main stem was completely defoliated and the bud rudiments contributing to the second flush were also shed. Floral parts like bracteoles and petals in the case of a few small flower buds that got dusted showed injury but did not drop off. These flowers even opened and set bolls.

In the plots treated with pentachlorophenol, the dose of one lb. per acre did not show any leaf injury, while in the treatment with 2 lb. per acre, the veins on the upper side appeared scorched and blackened within 3 days. Thereafter the leaves in the latter treatment started showing mottled appearance with yellow dots in patches. There was no further effect and no defoliation occurred.

The pickings commenced 15 days after the application of the chemicals. Weekly pickings were taken to assess the Bartlett's earliness index and boll weight. The data on yield of *kapas* per acre, Bartlett's earliness index, boll weight and boll index are presented below:

TABLE I.

S. No.	Treatments	Yield of kapas in lb./acre	Bartlett's earliness index	Boll weight in grams	Boll index (per lb.)
1.	Calcium cyanamide at 40 lb./acre	603	<b>0.746</b>	(3.8)	119
2.	do. 45 lb./acre	823	<b>0.751</b>	(3.5)	129
3.	do. 50 lb./acre	625	<b>0.751</b>	(3.5)	129
4.	Pentachlorophenol 1 lb./acre	1009	0.658	4.6	99
5.	do. 2 lb./acre	627	0.604	4.2	109
6.	Hand clipping of leaves	591	<b>0.756</b>	(3.6)	128
7.	Control (untreated)	790	0.647	4.4	104
	'F' test satisfied or not @ 5% P	yes	yes	yes	yes
	Critical difference	247	0.063	0.3	18.1
	Standard error	83.2	0.017	0.08	6.2

N. B.: Values better than control are in bold letters and poorer ones bracketted.

**Discussion:** It is seen that though the yield differences are significant none of the treatments is either better or poorer when compared to the control. It is, therefore, surmised that the defoliant have no deleterious effect on the yield of seed cotton.

Regarding earliness it is seen that application of calcium cyanamide (40, 45 and 50 lb./acre) and hand clipping have induced earliness in harvest compared to the control as denoted by the Bartlett's index. This is also in conformity with the fact that the pickings in the above four treatments were completed two weeks earlier than the control.

As regards boll weight, it is seen that the differences are significant and that the treatments with calcium cyanamide at 40, 45 and 50 lb. per acre and hand-clipping of leaves have reduced the boll weight significantly over the control under Coimbatore conditions.

Defoliation is a process of differential growth resulting in the formation of an abscission layer. Desiccants are usually chosen in treating plants with less foliage composed of smaller leaves and lacking plant activity for good defoliation. Pentachlorophenol is a desiccant. The strength of 0.1 and 0.2 per cent do not seem to be enough to cause death and desiccation of the leaves. Further, the Cambodia cotton of Madras State exhibit a good vegetative vigour and thick foliage. The use of a desiccant on such a type may even increase the trash as it may desiccate the leaves without abscission formation and the result will be a large quantity of dry leaves present in the immediate vicinity of the open bolls. Hence it may be appropriate that a desiccant is avoided in

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the case of Madras Cambodia Cottons. But pentachlorophenol at 0.1% has registered the highest numerical yield though the increase over the control is not statistically significant.

**Summary and Conclusions:** 1. It is seen from the preliminary study on the use of chemical defoliant on MCU. 1 cotton that the application of calcium cyanamide at 45 lb. per acre is the optimum dose under Coimbatore conditions.

2. Generally the defoliant have no adverse effect on the yield of seed cotton.

3. Calcium cyanamide induces earliness in harvest by two weeks.

4. Application of Calcium cyanamide at 40, 45 and 50 lb. per acre reduces boll weight.

5. Pentachlorophenol, a desiccant at 0.1 and 0.2% did not exhibit any effect but registered numerically highest yield at 0.1%.

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