

Studies on the Effect of Some Factors on the Development of Sugarcane Roots and Plants

M. A. Hamid Miah, A. K. M. Quadrat-E-Khuda and M. Shahjahan
Sugarcane Research & Training Institute,
Ishurdi, Pabna, Bangladesh.

ABSTRACT

Experiments were conducted in pots and field to study the effects of some factors, such as Heptachlor-treated soils, depths of Ploughing, Furadan treatment and soil sterilization on the development of sugarcane roots and plants. The pots were filled up with soils collected from Mobarakganj Sugar Mills (Heptachlor used several times), Modhupur (Heptachlor used once), Mobarakganj Sugar Mills (Heptachlor used several times, but the soil sterilized before use), Regional Agric. Research Station of the BARI Farm (Heptachlor never used), Ishurdi. The effects of Furadan treatment and depth of ploughing were studied in the field. The result showed that the Heptachlor treated soils, sterilized soils, depth of ploughing have no differential effects on roots and plants. The Furadan treatment did not bring any significant change in root volume and weight of cane.

INTRODUCTION

Development of sugarcane roots in Bangladesh has been reported to be poor because of some known and unknown causes (Bull, 1980 ; Anonymous, 1981a). Continuous use of soil pesticides of chlorinated hydrocarbon group was assumed to be one of the causes (Personal observation). Soil samples of a few farms of MKSM and Carews, suspected to be the area of poor root development, were collected and sent for chemical analysis to Bureau of Plant Industry, Manila, The Philippines. This analysis revealed that Heptachlor present in the soil was around 0.01 mg/kg and Dieldrin ranged from 0.01 to 0.03 mg/kg (Anonymous, 1981b). In addition, other organisms including nematodes also caused considerable damage (Anonymous, 1981a).

It was not exactly known whether any unidentified micro-organism, accumulation of toxic residues or cultivation methods affected root development. Therefore, experiments were set up to study the effects of some factors on root volume and plant weight.

MATERIALS AND METHODS

Experiments were conducted in pots at the Sugarcane Research & Training Institute (half drum, 57cm dia) and in a field of Regional Agriculture Research Station (RARS) at Ishurdi.

Pot Experiment :

Soil was collected from the Mobarakganj Sugar Mills Farm (MKSM : Heptachlor used several times), Modhupur (Heptachlor used only once), Mobarakganj Sugar Mills (Heptachlor used several times, but the soils were sterilized before use), and Regional Agriculture Research Station (RARS) of the Bangladesh Agriculture Research Institute (BARI : Heptachlor never used).

Four half-drums were filled up with soil of each location. Another set of four half-drums were filled with MKSM soil previously sterilized by heating on furnace. Thus soil of these four types viz. heptachlor treated once, several time, untreated and sterilized, were considered as treatments and replicated four times. Three sets of Isd.16 with two eye buds were planted in each drum on 2/1/81. All the plants were equally fertilized and irrigated.

Field Experiment :

A piece of land in the Regional Agriculture Research Station of BARI at Ishurdi was selected, where no soil pesticide was applied in the past. The land was primarily ploughed with an indigenous plough. Then the plots were ploughed at different depths and pesticides were applied in a few plots. The different treatments were as follows :

- A. Deep ploughing+Shallow plantation
- B. Shallow ploughing+Shallow plantation
- C. Deep ploughing+Deep plantation (control)
- D. Haptachlor 40WP to C
- E. Furadan 3G to A
- F. Furadan 3G to C.

Each plot measured 10m X 5m and the treatments were replicated thrice in RCB design. Fifty sett/shallow trench and 50 sett/deep trench were planted. Heptachlor was applied in all the trenches at a dose of 2.0 kg a.i./ha. Moreover, Furadan @ 2.0kg a.i./ha and Hetachlor @ 2.0kg a.i./ha were applied in the last week of April, 1981. All intercultural operations were done except any plant protection measure.

COLLECTION OF DATA :

Pot Experiment :

Plants of each drum were harvested and their numbers, height and weight were recorded. The soil including the roots was taken out of the drum and washed. The volume of roots was measured by water displacement method. Data were collected on (a) Root volume/cane and (b) weight/cane for analysis.

Field experiment :

In the third week of December, 1981, data collection was initiated. Five stools from each plot was selected at random. An area of 60cm X 60cm was measured and the plants in the area were counted and their height, weight were recorded. Soil of this area was dug out including roots, the depth of the pit being 60cm.

All these soil and root materials were washed in water over thin cloth. The roots were separated and their volume measured by water displacement method. Finally, data were recorded on (a) Root volume/cane (b) Weight of 100 canes for analysis.

Data collected from the pot and field experiments were statistically analysed and presented in Tables 1 & 2.

RESULTS AND DISCUSSION

Soil of BARI Farm at Ishurdi was free from any soil pesticide. Modhupur soil received Heptachlor only the year the samples were collected. It was the soil of MKSM that received various kinds of soil pesticides regularly. Experiment in the pots did not show any significant effect of different soils on any parameter studied (Table 1). In spite of the differences in pesticide contents, all the parameters, showed similar response. Total root volume per drum although differed with treatments, but this was probably because of different number of cane per drum. This was indicated by no difference in root volume per cane collected from different treatments.

Table 1. Effect of Heptachlor-treated Soils on Sugarcane Roots and Plants (Figures indicate means)

Treatments	Weight/cane (kg)	Root volume/cane (ml)
Modhupur Soils	0.47a*	378.98b
MKSM Soils	0.62b	392.14b
MKSM Soils (Sterilized)	0.60b	307.72a
BARI Farm Soils	0.69b	302.51a

* Figures accompanied by the same letter are not significantly different.

In the field experiment, roots and weights of cane were unaffected by all the treatments. Deep ploughing with deep plantation (control) even though have apparently shown lower root volume/cane than others, but there was no significant difference. The application of Furadan to the treatment A (Deep ploughing+Shallow plantation) and to C (Deep ploughing+Deep plantation) could not bring any significant change in root volume and weight of canes (Table 2). Even the Heptachlor use to the treatment C (Deep ploughing+Deep plantation) did not show any effect.

Table 2. Effects of Pesticides and Ploughing Depths on Sugarcane Roots and Plants (Figures indicate means).

Treatments	Root volume/cane (ml)	Weight of 100 canes (kg)
(A) Deep ploughing+ Shallow planting	102.57a*	71.74a
(B) Shallow ploughing+ Shallow plantation	116.40a	86.49a
(C) Deep ploughing+ Deep plantation	91.22a	84.08a
(D) Heptachlor to C	106.88a	104.92a
(E) Furadan to A	87.25a	99.59a
(F) Furadan to C	111.86a	92.05a

* Figures accompanied by the same letter are not significantly different.

During the growth of the plants in the pots, it was observed that plants grown in Modhupur soil showed susceptibility to water stress. These plants used to show wilting symptoms if water was not applied. The probable cause of such stress in the pot was attributed to the light nature of soils collected from Modhupur.

The present experimental results demonstrated that there was no significant effect of Heptachlor-treated, untreated and Furadan-treated, and depth of ploughing on roots and weight of sugarcane. The poor root development may probably be due to factors (Anonymous, 1981a) other than those studied above. The water stagnancy in some areas, soil moisture stress and nematode infestation in others might have been causing noticeable effect on root development in sugarcane.

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