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## Effect of Metasystox Application on Cottonseeds Quality

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**Abstract:** Two field experiments were carried out at the Agricultural Farm of the Faculty of Agriculture, University of Khartoum to study the effect of the insecticide Metasystox on cottonseed quality of two local cultivars, Barakat-90 and Barac-67. Three levels of concentrations of this insecticide were applied on field grown cotton. Oil, protein, phytic acid, and minerals content of cottonseeds were determined. The results showed significant increase in cottonseed oil of Barakat-90 and Barac-67, as influenced by different levels of treatments. Protein content increased significantly in cottonseeds of both cultivars. In contrast, the results of phytic acid, showed no significant difference in Barakat-90 cultivar. However, significant reduction was observed in Barac-67 cultivar. The value of mineral content of both cultivars have no consistent pattern of change.

**Key words:** Metasystox, cottonseed, oil, protein, tannin, phytic acid, minerals

### Introduction

Cotton (*Gossypium spp.*) is one of the major fibre crops grown in world. Its large production areas demonstrate clearly its magnitude as an agricultural crop (FAO, 2000). Right from seed germination to maturity, this crop is suffering from insects' damage (Stapley and Gayner, 1969). Insecticides from different chemical classes are generally used as a main strategy to combat and control these insects (Guantick, 1985). Although the main target of these insecticides is supposed to be on the insects, some of these chemicals may have side effect on the treated plants. These effects may be through their interaction with biochemical and physiological pathways (Singh *et al.*, 1985) or may be associated with insects infestation which in turn influenced plants physiology and biochemistry (Jood *et al.*, 1995). Many studies were carried out to investigate the effect of different pesticides on the different biochemical constituents of leaves, fruits and seeds of many horticultural and field crop. (Singh *et al.*, 1985; Sandhu *et al.*, 1987 and Mather *et al.*, 1990). The aim of this study was to investigate the changes in cottonseeds oil, protein, phytic acid and minerals, as affected by the application of the organophosphorus insecticide Metasystox which is commonly used in irrigated cotton in Sudan.

### Materials and Methods

The seeds of two cotton cultivars, Barakat-90 and Barac-67, were obtained from cotton breeding department, Agricultural Research Corporation. The insecticide Metasystox was purchased from local market. Metasystox analytical standard was obtained from the pesticides formulation laboratory, Agricultural Research Corporation.

**Field experiments:** Two field experiments were carried

out during the season 2000 / 2001 and 2001 / 2002 in the research farm of the Faculty of Agriculture, University of Khartoum, Shambat. The area of both experiments was composed of 24 plots, each plot was 5x5 m<sup>2</sup>, each plot was divided into five ridges, the length of each was four meters, spacing between ridges was 70 cm, and between holes was 50 cm. The seeds of the two cotton cultivars, Barakat-90 and Barac-67, were sown on the 7<sup>th</sup> day of August. Weekly irrigation system was practiced. Five weeks after sowing, the experiments were fertilized with urea at a rate of 60 Kg / feddan. Thinning, weeding and other cultural practices were carried out as recommended (ARC, 1996). The insecticide Metasystox was applied at three levels, recommended dose, 1.5 and two folds the recommended dose. Treatments were replicated three times in a randomized complete block design. Samples from each plot were harvested manually.

**Preparation of samples:** The harvested samples were delinted mechanically, the delinted seeds of Barac-67, were treated with 50% aqueous sulphuric acid to remove the fuzz following the method described by Hussein (1987). The seeds were milled, mixed properly and stored for chemical analysis.

**Chemical analysis:** crude oil, Total crude protein of cotton seeds samples were estimated according to Official Methods of analysis (AOAC, 1984), Calcium, Magnesium sodium, potassium, iron, and copper were estimated in mg/100 g by atomic absorption spectrophotometer (Perkin Elmer model 3110). Determination of phytic acid content of cottonseeds samples was carried out according to the method described by Wheeler and Ferrel (1971).

**Statistical analysis:** Results were statistically analyzed using General Linear Model Procedure described by (SAS, 1999). Duncan's Multiple Range Test was used for means separation.

**Results and Discussion**

Fig. 1 shows the effect of different treatments of the insecticide Metasystox on the cottonseed oil content of Barakat-90 and Barac-67 cultivars, in the first and second seasons. The results indicated that, oil content of cottonseed of both cultivars in the first season, was significantly higher than the untreated control. However, in the second season, no significant differences were observed in Barac-67 cultivar. These findings are not in agreement with those obtained by Epp (1953) and Kittock and Pinkas (1971), who reported that application of pesticides usually causes reduction in cottonseed oil content. The oil content of Barakat-90 cultivar in both growing seasons with all treatments was significantly higher than that of Barac-67 cultivar. This finding is in harmony with what was reported by Pandey and Thejappa (1978) who found that *G. hirsutum* seed oil content was significantly higher than of that *G. barbadense* variety.

Effect of different treatments of the insecticide Metasystox, on protein content of Barakat-90 and Barac-67 cultivars in the first and second seasons, is shown in Fig. 2. Protein content results of all treatments of both cultivars, in the first season, were significantly higher than that of the control. For the second season, significant difference was also observed, except in the first level of Baracat-90, and the second level of Barac-67. These results agree with those of Chakraborti *et al.* (1980) who observed that the organophosphorus insecticide, has been shown to increase protein synthesis in plant, moreover, Habiba *et al.* (1992) found that the pesticide application increase the total protein of potatoes.

However, in most treatments, and In both seasons, protein content of Barac-67 was significantly higher than that of Barakat-90. This finding confirmed what was reported by Pandey and Thejappa (1978) who stated that any increase in cottonseed protein will result in relative reduction in oil and vice versa.

Fig. 3 illustrates the results of phytic acid content of cottonseeds for Barakat-90 and Barac-67 cultivars, as affected by Metasystox, in the first and second season. It is apparent from these results that, in most treatments, no significant different was observed in Barakat-90 cultivar, in both season, except in the second level treatment, in the first season which was significantly lower than that of the control. While in Barac-67 treatments, significant Increase was observed in the first season, and vice versa in the second season. These results may associate with the level of insects infestation which in turn influenced the antinutrient

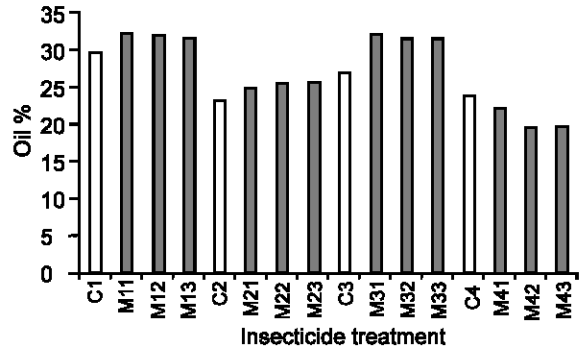


Fig. 1: Effect of Metasystox level on oil content of cottonseeds

C<sub>1</sub>: Control, M<sub>11</sub>: Recommended dose of Insecticide, M<sub>12</sub>: 1.5 fold dose of Insecticide, M<sub>13</sub>: Double dose of Insecticide (Barakat-first season), M<sub>21</sub>: Recommended dose of Insecticide, M<sub>22</sub>: 1.5 fold dose of Insecticide, M<sub>23</sub>: Double dose of Insecticide (Barac-First season) C<sub>3</sub>: Control, M<sub>31</sub>: Recommended dose of Insecticide, M<sub>32</sub>: 1.5 fold dose of Insecticide, M<sub>33</sub>: Double dose of Insecticide (Barakat-second season), C<sub>4</sub>: Control, M<sub>41</sub>: Recommended dose of Insecticide, M<sub>42</sub>: 1.5 fold dose of Insecticide, M<sub>43</sub>: Double dose of Insecticide (Barac-second season)

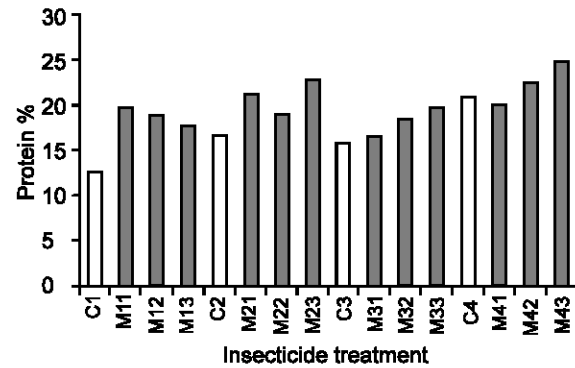


Fig. 2: Effect Metasystox level on protein content of cottonseeds (Footnote as par Fig. 1)

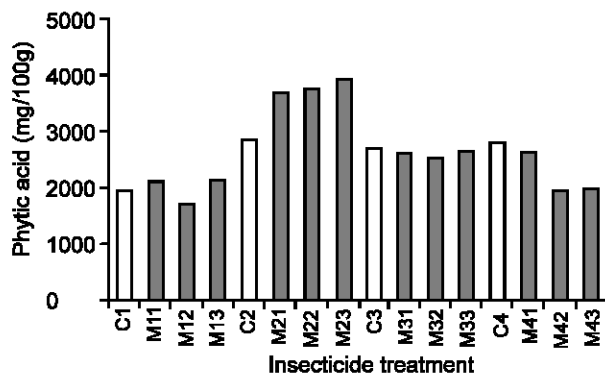


Fig. 3: Effect of Metasystox level on phytic acid content of cottonseeds (Footnote as par Fig. 1)

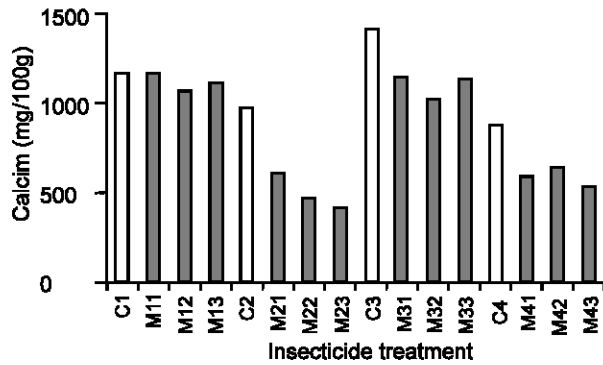


Fig. 4: Effect of Metasystox level on calcium content of cottonseeds (Footnote as par Fig. 1)

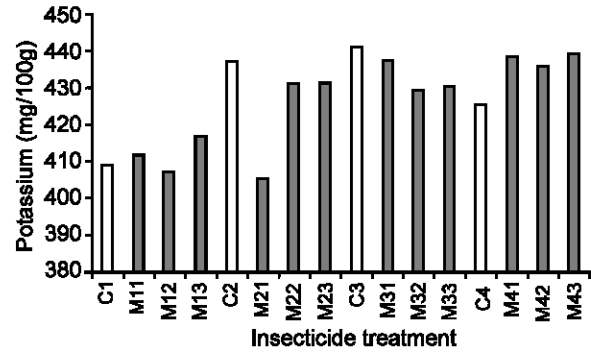


Fig. 7: Effect of Metasystox level on potassium content of cottonseeds (Footnote as par Fig. 1)

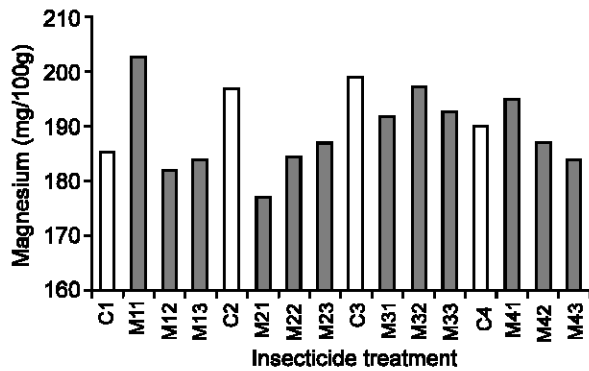


Fig. 5: Effect of Metasystox level on magnesium content of cottonseeds (Footnote as par Fig. 1)

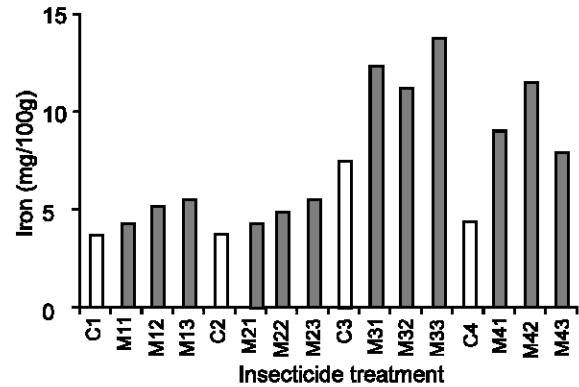


Fig. 8: Effect of Metasystox level on iron content of cottonseeds (Footnote as par Fig. 1)

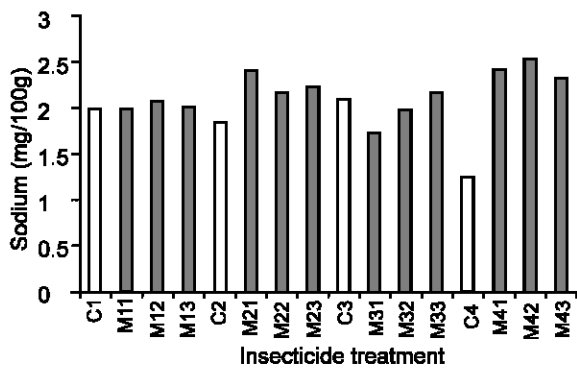


Fig. 6: Effect of Metasystox level on sodium content of cottonseeds (Footnote as par Fig. 1)

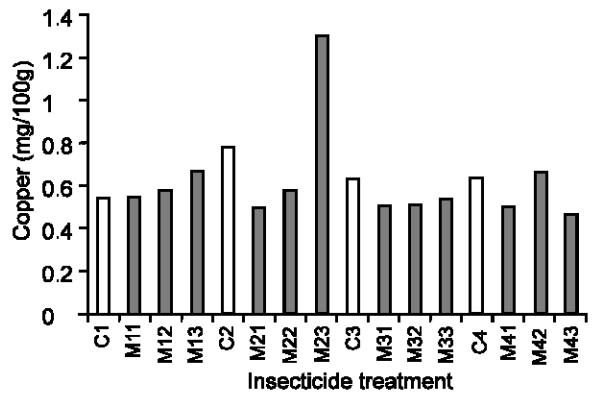


Fig. 9: Effect of Metasystox level on copper content of cottonseeds (Footnote as par Fig. 1)

contents of seeds (Modgil *et al.*, 1993). Moreover, it was reported that infestation of seed crops with the insect *Callosobruchus chinensis* (Bruchid), caused significant reduction in phytic acid compared to the control (Modgil and Mehta, 1997).

The effect of different levels of Metasystox, on minerals content is shown in Fig. 4 to 9, in both seasons for both cultivars. It can be seen from these figures that, in the

first season, significant reduction was observed in calcium concentration, which was in agreement with what was obtained by Cathey and Bailey (1987) who observed that calcium uptake decreased in cotton plant treated with chlordimeform insecticide. While in the second season significant increase was observed in Barakat-90. For Iron concentration results in both

seasons and for both cultivars, significant reduction was also observed, and this may directly be associated with insects type and population. Modgil (2000) reported that infestation of mung pea and pigeon pea with pulse beetle, increase iron content in its seeds. However, for Magnesium, sodium, potassium, and copper no consistent pattern of change was observed. These variations in results may be closely attributed to the effect of insecticides on insect infestation, as confirmed by Ojmelukwe *et al.* (1999) who reported that, insects infestation directly affect minerals content depending on the type of insect and the level of infestation.

In conclusion, significant changes in chemical constituents of cottonseeds is observed in some constituents as affected by application of *Metasystox* insecticide. some changes have no consistent pattern.

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