

**SOLARIZATION, MECHANICAL AND CHEMICAL WEED
CONTROL IN PEANUT (*Arachis hypogaea* L.)**

By

Hussein Fawzy Hussein

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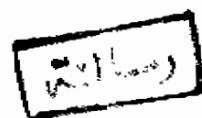
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By

Hussein Fawzy Hussein

B. Sc. (Agriculture), Alexandria Univ., 1977

M. Sc. (Agronomy), Ain Shams Univ., 1986

This thesis for Ph. D. degree has been
approved by:

Prof. Dr. Y.M. Osman *Yassin M. Osman*
Undersecretary of State, Ministry of Agriculture

Prof. Dr. T.Y. Rizk *Tawakul Rizk*
Prof. of Agronomy, Ain Shams Univ.

Prof. Dr. M. Taher B. Fayed *M. T. Fayed*.....
Prof. of Agronomy, Ain Shams Univ.

Date of examination: 16 / 2 / 1992



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Hussein Fawzy Hussein

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Under the Supervision of:

Prof. Dr. M. Taher B. Fayed

Prof. of Agronomy, Faculty of Agriculture, Ain
Shams Univ.

Dr. Sabry M. H. El-Naggar

Ass. Prof., Plant Department, National Research
Centre

ABSTRACT

Two field experiments were conducted in a private farm at Kafr-Hakeem village, at Embaba District, Giza Governorate during 1987 and 1988 seasons to study the effect of solarization (by mulching soil with transparent polyethylene sheets), mechanical and chemical weed control treatments on peanut plants, associated weeds, nodule formation, yield and quality and some soil properties. The results indicated that:

- All weed control treatments reduced significantly the density (%), number and fresh and dry weights of peanut weeds as compared to the unweeded treatment. The most promising treatments for weed control in peanut field were: penoxalin + one hoeing, 2 or 3 ordinary hand hoeings, pre-sowing irrigation + two hoeings and pre-sowing irrigation + paraquat + one hoeing treatments.

- Weeds grown with peanut plants reduced significantly the fresh and dry weights of peanut plants as well as numbers and fresh and dry weights of peanut nodules/ plant 60 days old by about 60.2, 52.0 and 48.8%, respectively compared with those received three-hoeing treatment. All herbicidal treatments under investigation (Penoxalin, vernolate and oxadiazon) showed no hazardous effect on growth and root nodulation of peanut plants.

- Weeds reduced significantly the pod number/plant, pods yield/fed., seed yield/fed. and straw yield/fed. by 44.9, 42.6, 41.5 and 49.9%, respectively, compared to the three-hoeing treatment.

- Controlling peanut weeds by penoxalin + one hoeing, hoeing 3 times, pre-sowing irrigation + two hoeings and two hoeings treatments significantly exceeded the pods yield/fed. by 75.4, 74.2, 70.2 and 67.7%, and seed yield/fed. by 71.4, 70.9, 70.0 and 68.5% over the unweeded treatment, respectively.

- Quality characters and chemical composition of seeds and straw of peanut plants were not markedly affected by weed control treatments.

- Solarization increased N, P, K, Na and EC levels in soil, but had a slight effect on O.M. (%) and pH of solarized soil. Total microbial flora, total fungi and total *Azotobacter* counts were affected by solarization treatments.

- Solarization is not the best method for weed control in peanut. The efficiency of this new technique in controlling total weeds still less than those of common hand hoeing practices irrespective of the undetectable differences in yield obtained by the two methods. Costs of solarization method in Egypt will be markedly higher than the economic returns from the obtained increases in peanut yield. Moreover, controlling weeds with solarization mostly needs more than 5 weeks to achieve promising results and this return will disturb crop rotation.

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INTRODUCTION

INTRODUCTION

Peanut or groundnut (*Arachis hypogaea* L.) is one of the most important leguminous crops all over the world and in Egypt in particular.

Due to the high nutritive value of peanut seeds for human and the produced cake as well as the green leafy hay for livestock, in addition to the important seed oil for industrial purpose, research activities have been intensified in Egypt as well as over the world in order to increase the crop productivity.

Weeds are one of the major factors affecting peanut production. Hand hoeing still the main common method for controlling peanut weeds in Egypt. The expensive and scarce of hand-labour presents a continuous increase in using herbicides.

Soil solarization is a method successfully used in many countries to control or reduce soil borne plant pathogens and weeds. Solarization not only increased yield but also improved the quality of peanuts harvested and the proportion of grade A was increased even more than the total yield (Grinstein et al., 1979).

Many farmers now combine a reduced-cultivation program with a herbicide program and get better weed control than by

cultivation alone. The additional of one light hoeing destroys the weed plants which survived and escaped from the herbicides and causes good aeration of the soil which encourages the growth and yield of crop (cotton) plant (Fayed *et al.*, 1983).

The objectives of this study were 1). to develop systems of weed control for peanuts which would be adapted to a wide spectrum of weeds; 2). to study the effect of solarization, mechanical and chemical weed control treatments on plant growth, nodulation and crop productivity and chemical composition of peanut plants and 3). the side effect of soil solarization on some microbial and chemical properties of soil.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

In order to fulfil the objective of this study, the literature is reviewed under the following broad categories:

- A. Effect of weed infestation on peanut plants.
- B. Effect of solarization technique.
- C. Effect of mechanical weed control.
- D. Effect of chemical weed control.
- E. Complementary effect between mechanical and chemical weed control.

Subdivisions of each category are concerned with results obtained on either weeds or groundnut plants.

A. Effect of weed infestation on peanut plants:

1. On growth:

Ishag (1971) found that weed infestation significantly decreased number of branches per plant, suppressed the production of flowers and consequently number of pods per peanut plant.

Chamblee et al. (1982) mentioned that full-season *Brachiaria platyphylla* reduced peanut biomass (dry weight) significantly from 6 weeks after planting until harvest.

Ramirez and Bendixen (1982) reported that *Cyperus esculentus* affects crops directly by competing for light, nutrients and water and by rhizome penetration of the

undergrounds predisposing the crop to secondary infection by pathogens, imparting off-flavours to the food. Weed infestation in peanut field reduced the relative growth rate (RGR) and net assimilation rate (NAR) (Banyikwa and Rulangaranga, 1985). Leaf area expands relatively slowly, and vertical growth is both slow and inherently limited, groundnuts are very sensitive to competition with weeds. The groundnut is not usually covered until several weeks after sowing; thus, annual weeds are not sufficiently controlled by shading and weeds of upright habit readily shade the young crop in these critical formative stages (Bunting *et al.*, 1985).

Singh *et al.* (1987) reported that dry matter production of crops kept weed free from 45 days after sowing until harvesting was 8.5 to 8.7 g/plant, compared with 6.1 and 6.8 g for crops kept weed free for 15 and 30 days after sowing, respectively and 5.4 g for unweeded crops.

Hamada *et al.* (1988) found that weed free maintenance for 6 to 8 weeks resulted in an increase in plant stand of peanuts.

2. On peanut root nodules:

Barnyard grass reduced the nodules number per plant, the nodules dry matter/plant, single nodule weight and the rate of the N_2 -fixation per plant. The negative effect of barnyard grass on nodulation and N_2 -fixation of soybeans