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# FERTILIZATION EFFICIENCY AND RESPONSE TO TECHNIQUE OF FERTILIZER APPLICATION

Ву

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A thesis submitted in partial fulfillment  $\qquad \qquad \text{of} \qquad \qquad \text{the requirements for the degree of}$ 

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### Approval Sheet

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### **Abstract**

Mechanization of fertilization practice was evaluated using the injection of ammonia solution into soil, two rates of both solid fertilizers of urea (46.5 %N) and ammonium sulfate (20.6 %N) being also evaluated for comparison.

Ammonia solution (27 %N) was injected in a clay

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soil field using a designed small machine to evaluate the fertilizer efficiency at different injection pressures and tractor speeds. Such evaluation was performed through evaluation for plant behaviour to finally evaluate economically the adopted mechanization practice of fertilization as compared to classic approach of fertilization with solid fertilizers.

Results showed that application of liquid ammonia was suitable for growth and yield of wheat plants and their uptake for N, P and K. This was reflected on nutritional status of the obtained grains.

Data also revealed that injection pressure was greatly favourable up to 3 kg/cm<sup>2</sup>, relatively less responses being obtained towards the high injection pressure of 6 kg/cm<sup>2</sup>. Results also showed that tractor speed was greatly favourable in spite of relatively less response at values more than 3.5km/h which appeared to be superior. Interaction analyses for the obtained data showed that injection pressure of 4 kg/cm<sup>2</sup> accompanied with tractor speed of 3.5 km/h seemed to be superior for all plant parameters under study.

As for solid fertilizers, the source had no great effect on grown plants which were, however, positively responded to applied rate whose high values were more superior during the whole studied growing season.

# FERTILIZATION EFFICIENCY AND RESPONSE TO TECHNIQUE OF FERTILIZER APPLICATION

### KEY WORDS

Mechanical application: Injection pressure,  $kg/cm^2$ . Tractor speed, km/h.

Fertilizer application: Ammonia solution.

Ammonium sulfate.

Urea.

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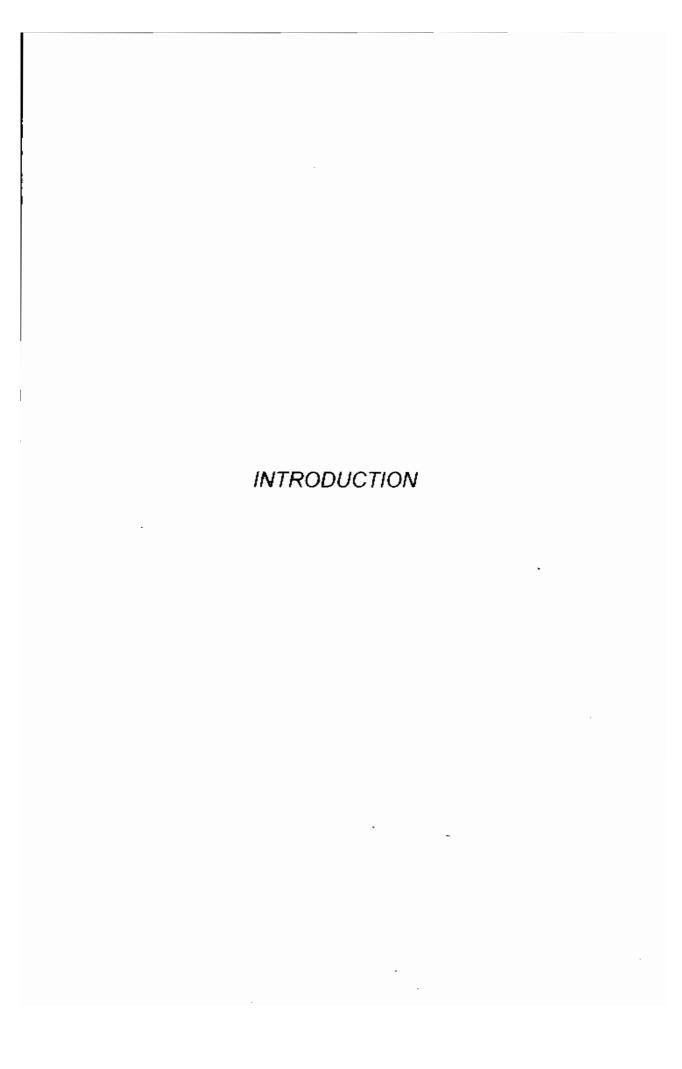
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#### INTRODUCTION

Nowadays, it is settled that modern machine is an important practice to increase crop productivity per unit area and decreasing costs of crop production.

For developing countries, the benefits of appropriate agricultural mechanization should be realized, machines being manufactored locally for three primary reasons:

- Imported machines are usually designed for temperate zone conditions, such as those prevaling in U.S.A. or Europe, or sophisticated farmers such as those in Japan. In general, the machine is more likely to reflect the needs of local farmers and agronomic conditions.
- Foreign exchange is usually in short supply.
- Local supply of labour can be utilized.

In Egypt, the agricultural cultivated area is limited with great difficulty to be weidely extended. Therefore, vertical expansion in agriculture should be of great interest. This can be performed by several means, one of which is enriching the soil by fertilizers using modern machines for application.

Soils of Egypt are known to be poor in available nitrogen due to their low content of organic matter

and presence of rather small amounts of organic manures added to them annually. Therefore, the application means of fertilizers for raising the production of most crops should be taken into consideration, several nitrogenous fertilizers being used including both liquid fertilizers, as well as, solid ones involving ammonium sulfate, calcium nitrate, ammonium nitrate and urea.

This study has been performed using a designed small machine able to inject the soil with ammonia solution as a trial to lessen the costs of broadcasting solid nitrogen fertilizers. The work included the definition of the tractor speed, as well as, pressure required for optimum injection, which should be reflected on having the best plant characteristics and yield of wheat crop.

