

Abstract

IMPROVING THE EFFICIENCY OF POTASSIUM FERTILIZATION IN SOME EGYPTIAN SOILS.

Purpose:

This work aims to study some different methods that can be used to improve the efficiency of potassium fertilization in sandy and clay soils of Egypt. Three sources of potassium fertilizers (i.e. mineral-K, Feldspar-K and compost rich in-K) were added as single, dual or in a combine form as well as inoculation seeds of faba bean with or without potassium dissolving bacteria, represent the different suggested ways in this study.

Material and Methods :

This work included three main factors. Three experimental factors were inoculation with/ or without K-dissolved bacteria *Bacillus circulans* (KDB), treatments of potassium fertilizer types (seven treatments as well as control) and the rates of their application (three rates). All pots received the basic doses of N & P mineral fertilizers. Potassium fertilizer types were added as 50%,75% and 100% of the recommended dose (R D). Seeds of broad bean plants (*Vicia Faba. L*), cv.Giza 843 variety, used in this study as indicator plant.

Results:

The obtained results could be summarized as follows:-

****** Inoculation with *Bacillus circulans* recorded, in the two soils, higher straw, seeds and biological yields as well as higher nutrients uptake than the non- inoculation treatments.

Increasing rate of any form of K- fertilizer increased the yields of faba bean and nutrients content of straw and seeds comparing with the control treatment.

Generally, the profitable treatments were those treated with Mineral-k, feldspar-K or mixture between them at high rate of fertilization under inoculation with *Bacillus circulans*.

The economic ability of the experimental treatments, through calculation of the differences between costs of production (L.E/fed) and incomes profits (L.E/fed) to obtain the net gain or return (L.E/fed) treatments, to choose the best treatments which gave the highest financial return (L.E/fed).

CONTENTS

	<i>Page</i>
I- INTRODUCTION	1
2 - REVIEW OF LITERATURE	3
2.1. Potassium in soils	3
2.1.1. Forms and cycling of potassium in soils	4
2.1.2. Potassium in Egyptian soil.....	6
2.2. Potassium and plant growth.....	7
2.2.1. Effects of potassium on the growth and yield of different crops	9
2.2.2. Effect of potassium on nutrient contents of plants.....	13
2.2.2.1. Macronutrients content.....	13
2.2.2.2 Micronutrients content	15
2.3. some sources of k- supplying in soils.	17
2.3.1. potassium mineral fertilizers.....	17
2.3.2. Composted of plant wastes rich in potassium	19
2.3.3. Soil Rocks rich in potassium (Feldspars).....	22
2.4.Role of microorganisms in increasing the efficiency of soil – K	24
3- MATERIALS AND METHODS.....	28
3.1. Materials.....	28
3.1.1. Soils.....	28
3.1.2. Plant seeds.....	28
3.1.3. Sources of potassium fertilizers	28
3.1.4. Potassium dissolved bacteria (K D B).....	30
3.2. Experimental procedures.....	30
3.2.1. Preparation of experimental pots.....	30

3.2.2. Inoculation and planting of broad bean seeds.....	32
3.2.3. Fertilization and the treatments of potassium fertilizers.....	32
3.2.4. Harvesting and preparing samples for analysis.....	34
3.3. Analytical methodology.....	34
3.3.1. K- feldspars analysis.....	34
3.3.2. K- compost analysis.....	34
3.3.3. Plant analysis.....	35
3.3.4. Soil analysis	35
3.3.4.1. Routine chemical analysis:.....	35
3.3.4.2. Available nutrients analysis.....	36
3.3.5. Statistical methods	36
4. RESULTS AND DISCUSSION.....	38
4.1. Effect of inoculation with K.D.B (<i>Bacillus circulans</i>) and fertilization with different sources & rates of potassium on faba bean plants grown in sandy soil	38
4.1.1. Yield components (g/pot)	38
4.1.1.1. Straw yield.....	39
4.1.1.2. Seeds yield.....	46
4.1.1.3. Biological yield.....	47
4.1.2. Uptake of some macro-nutrients	49
4.1.2.1. N- uptake (mg/pot)	49
4.1.2.2. P – uptake	56
4.1.2.3. K- uptake	62
4.1.3. Uptake of some micro-nutrients (mg/pot).....	70
4.1.3.1 Fe- uptake	70
4.1.3.2. Mn- uptake.....	77
4.1.3.3. Zn- uptake (mg/pot)	84
4.2. Effect of inoculation with K.D.B (<i>Bacillus circulans</i>)	

and fertilization with different sources and rates of potassium on faba bean plants grown in a clay soil	91
4.2.1. Yield components (g/pot).....	91
4.2.1.1. Straw yield.....	91
4.2.1.2. Seeds yield	99
4.2.1.3. Biological yield	101
4.2.2. Uptake of some macro-nutrients (mg/pot)	102
4.2.2.1. N- uptake	102
4.2.2.2. P- uptake.....	109
4.2.2.3. K- uptake.....	116
4.2.3. Uptake of some micronutrient (mg/pot).....	123
4.2.3.1. Fe- uptake.....	123
4.2.3.2. Mn- uptake.....	130
4.2.3.3. Zn- uptake.....	136
4.3. Assessment of the experimental treatments	142
4.3.1. Apparent derived potassium percentage (ADK, %) by seeds.....	142
4.3.1.1 ADK% in sandy soil.....	142
4.3.1.2. ADK% in clay soil	145
4.3.1.3. Soil type in relations to yield (g/pot) and ADK% of seeds	147
4.3.2. Economic evaluation of the experimental treatments....	150
5. Summary	156
6. References.....	159