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Soils, Water & Environment Res. Ins. (SWERI)

Effect of Potassium Sulphate and Potassium Chloride on Soil Properties and Wheat, Faba Bean Production Under Middle Egypt Region Conditions.

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Dr. Salwa Eisa and Dr. Abdel Hadi, A.H.

Soils, Water and Environment Research Institute (SWERI)

Agriculture Research Center (ARC)

Ministry of Agriculture and Land Reclamation

(EGYPT)

Objectives:

- Evaluation of SOP Verses MOP on Wheat and Faba Bean Production under Old Land condition.
- Soil Chemical Properties after Wheat and Faba Bean Harvesting.

INTRODUCTION

In Egypt, wheat and Faba bean are considered the main important crops for their high nutritional values .

Potassium is consider a very vital ion for plants and known as " quality element"

The Supplying Power of Old Land for K did not Cover the requirements for Wheat and Faba bean

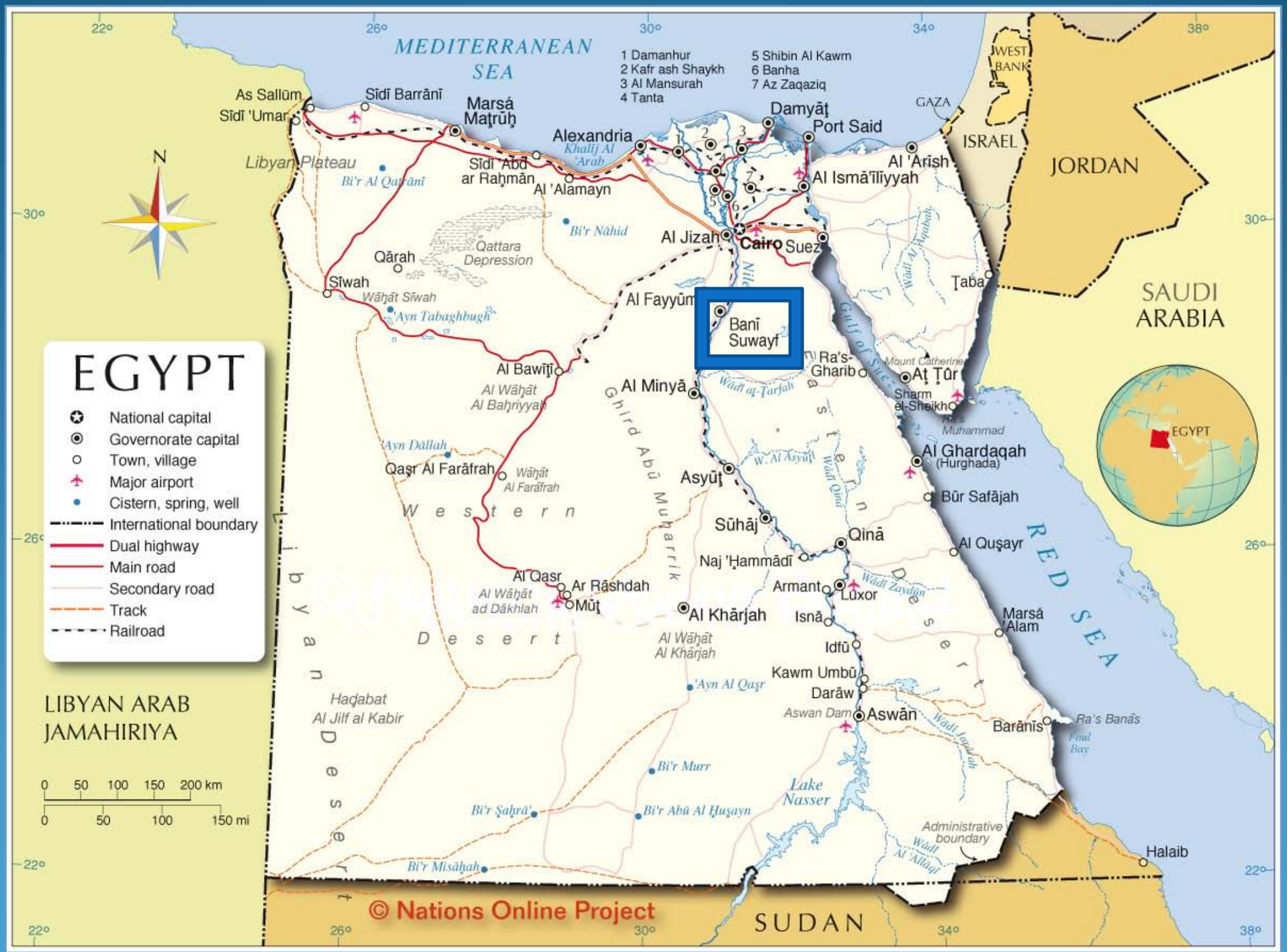
The two major fertilizer forms are potassium sulphate (sulphate of potash or SOP, 50% k_2O and 18% S) and potassium chloride (muriate of potash or MOP, 60% k_2O and 48% Cl).

Potassium sulphate (SOP) is presently the only source of potassium used in Egypt.

Potassium chloride (MOP) is a cheaper source of potassium, but it contains very high amount of chloride, which markedly worsens the phenomenon of soil salinization.

MATERIALS AND METHODS

Two field trials were carried out at Sides Research Station, Beni Suief Governorate Middle Egypt region



MATERIALS AND METHODS

In winter season 2009/2010 wheat plant variety (Beni Suief 1) and faba bean plant variety (Giza 843) were cultivated.

Two Sources of Potassium (SOP and MOP), were used in three rates .

A) Zero Level

B) 57 kg K_2O/ ha

C) 114 kg K_2O/ ha

Problems at Middle Egypt area

- Poor water quality.
- Ineffective drainage.
- Dangers of salinity build up.
- Excessive N-fertilizer use.
- Unbalance NPK rates.
- Build-up of biotic stresses.
- Shortage of Irrigation Water in summer season.

RESULTS AND DISCUSSION

Physical and chemical properties of the tested soil Before Cultivated

Characteristics	Value	
Particle size distribution (%):	Site 1 (wheat)	Site 2 (Faba bean)
Coarse sand	10.2	5.31
Fine sand	35.0	43.88
Silt	28.0	23.10
Clay	26.8	27.71
Texture class	Sandy clay loam	Sandy clay loam
Chemical analysis:		
pH(1:2.5 soil suspension)	7.25	7.35
Total carbonates (%)	2.73	3.00
Organic matter (%)	1.32	1.52
EC_e dS m^{-1}, soil paste	2.55	3.80
Soluble cations (meq/l)		
Ca^{++}	10.75	14.40
Mg^{++}	5.47	10.67
Na^{+}	8.52	12.00
K^{+}	0.77	1.17
Soluble anions (meq/l)		
$CO_3^{=}$	-	-
HCO_3^{-}	6.54	7.79
Cl^{-}	8.10	14.40
$SO_4^{=}$	10.87	16.05
Available N (µg g^{-1})	14.00	13.50
Available P (µg g^{-1})	5.90	5.60
Available K (µg g^{-1})	258.00	265.00

RESULTS AND DISCUSSION

Effect of K treatments on wheat and faba bean production

Treatments K2O(Kg/ha)	Wheat yield			Faba bean yield	
	Grains (ton/ha)	Straw (ton/ha)	1000 grains (g)	Grains ton/ha	100 grains (g)
Control	6.06	12.17	55.58	1.65	91.49
57 (as K2SO4)	6.11	13.36	54.63	1.77	91.27
114 (as K2SO4)	6.53	13.61	54.57	1.84	87.72
57 (as KCl)	6.09	13.23	56.22	1.73	89.33
114 (as KCl)	6.47	13.22	58.99	1.78	87.94
Means	6.25	13.12	55.99	1.75	89.55
L.S.D0.05	0.07*	0.13*	0.78*	0.08*	0.70*
C.V	5.40	4.40	0.62	5.28	0.10

RESULTS AND DISCUSSION

Effect of K treatments on proteins, P and K % for wheat and faba bean grains

Treatments K_2O(Kg/ha)	Wheat grains			Faba bean grains		
	Proteins %	P %	K %	Proteins %	P %	K %
Control	10.50	0.34	0.32	20.06	0.39	0.50
57 (as K_2SO_4)	12.32	0.39	0.46	22.01	0.47	1.01
114 (as K_2SO_4)	12.95	0.45	0.57	24.78	0.51	1.21
57 (as KCl)	12.26	0.40	0.49	23.60	0.46	0.98
114 (as KCl)	11.97	0.42	0.45	23.01	0.45	0.96
Means	12.00	0.40	0.46	22.69	0.45	0.93
$L.S.D_{0.05}$	0.36*	0.03*	0.03*	0.84*	0.03*	0.19*
C.V	1.32	3.71	3.31	1.63	3.25	8.93

RESULTS AND DISCUSSION

Effect of K treatments on proteins yields, P and K uptake for wheat and faba bean grains

Treatments K_2O(Kg/ha)	Wheat grains			Faba bean grains		
	Proteins Yields (Kg/ha)	P Uptake (Kg/ha)	K Uptake (Kg/ha)	Proteins Yields (Kg/ha)	P Uptake (Kg/ha)	K Uptake (Kg/ha)
Control	636.5	20.61	19.40	330.9	6.44	8.25
57 (as K_2SO_4)	752.4	23.82	28.09	390.2	8.33	17.91
114 (as K_2SO_4)	846.0	29.40	37.24	456.1	9.39	22.32
57 (as KCl)	747.7	24.42	29.91	407.6	7.95	16.92
114 (as KCl)	775.2	27.20	29.15	410.9	8.05	17.16
Means	751.5	25.09	28.76	399.1	8.03	16.51
$L.S.D_{0.05}$	21.43*	1.92*	2.36*	23.82*	3.35*	3.83*
C.V	1.26	3.38	3.62	2.63	1.94	10.24

RESULTS AND DISCUSSION

Soil properties after wheat and faba bean harvesting

Treatments K_2O(Kg/ha)	After wheat harvesting				After faba bean harvesting			
	pH	EC_e	K (µg g^{-1})	Cl (µg g^{-1})	pH	EC_e	K (µg g^{-1})	Cl (µg g^{-1})
Control	7.52	0.225	248	2.88	7.65	0.288	250	7.60
57 (as K_2SO_4)	7.51	0.235	268	2.72	7.71	0.295	275	6.20
114 (as K_2SO_4)	7.50	0.238	293	3.20	7.70	0.315	305	8.20
57 (as KCl)	7.60	0.248	253	47.40	7.73	0.318	260	61.4
114 (as KCl)	7.75	0.273	280	61.00	7.75	0.325	292	73.6
Means	7.57	0.244	268	23.44	7.71	0.308	276	31.4
$L.S.D_{0.05}$	0.03*	0.02*	6.68*	0.93*	0.04*	0.01*	2.58*	0.44*
C.V	0.21	3.40	0.93	1.83	0.23	1.48	0.33	0.64

Conclusions

- **Potassium consider a key factor in crop production**

- **Grains yield of faba bean significantly responded to the addition of K- fertilizers with slight increase for SOP comparing to MOP. In average SOP yielded 1.806 ton/ha and MOP 1.757 ton/ha versus 1.65 ton/ha for control.**

- **Wheat grains and straw yields also significantly responded to K-fertilizers, in average SOP gave 6.32 ton/ha grains and 13.49 ton/ha straw comparing to 6.28 ton/ha grains and 13.23 ton/ha straw for MOP versus 6.06 ton/ha grains and 12.17 ton/ha straw for control.**

- **After harvesting of faba bean and wheat, the soil plots which received MOP showed slightly higher increases in the ECe and higher soil chloride values than that received SOP.**

- **Protein content, P and K uptake for grains of faba bean and wheat was significantly increased by addition of K- fertilizers especially by SOP addition.**

Wheat Harvest

Faba Bean Harvest

Thank you

Friend