J. Agric. Sci. Mansoura Univ., 27(10): 6543 – 6556,2002

RESPONSE OF COTTON CULTIVAR GIZA 89 TO PRE-SOWING SOAKING SEED TREATMENTS

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ABSTRACT

Two field experiments were carried out at Gemmeiza Agricultural Research Station, Gharbia Governorate during 2000 and 2001seasons to study the effect of pre-sowing soaking cotton seed (cv. Giza 89) for 20 hours in solutions of 100 ppm gibberellic acid (GA_3); 1000 ppm ascorbic acid (AA) and an aqueous filtered solution of 2% calcium superphosphate (SP) in comparison with soaking cotton seed in water as a control on the required time to full germination, germination percentage, leaf chemical composition, growth, earliness, yield and yield components of cotton.

Generally, soaking cotton seed in GA_3 or in an aqueous filtered solution of SP significantly reduced the required time to full germination as compared with control. Soaking seed in AA decreased also this period but to a less extent. Also, germination percentage was significantly affected by soaking seed treatments. Soaking seed in GA_3 and in AA gave the highest values of germination percentage followed by that soaking in an aqueous filtered solution of SP while soaking seed in water (control) gave the lowest value.

In addition, soaking cotton seed treatments gave insignificant effect on leaf macronutrients (N, P, K, Ca and Mg) and copper concentrations at 120 days old. However, soaking cotton seed treatments significantly affected leaf Zn and Mn concentrations in favour of soaking seed in an aqueous filtered solution of SP. Leaf Fe concentration was significantly affected by soaking seed treatments but not follow a definite trend.

Soaking seed in an aqueous filtered solution of calcium superphosphate significantly increased the root dry weight / plant, fruiting parts dry weight / plant, total dry weight / plant, leaf area / plant and leaf area index at 120 days old as compared with soaking cotton seed in water (control). In addition, soaking cotton seed in the three experienced solutions (GA_3, AA and SP) significantly increased plant height at harvest and number of main stem internodes as compared with soaking cotton seed in water (control) .

Soaking cotton seed in an aqueous filtered solution of calcium superphosphate produced the highest values of number of open bolls/ plant, seed cotton yield / plant as well as seed cotton yield / fed. in both seasons as compared with other treatments. Whereas, soaking cotton seed in GA_3 gave the highest number of plants / feddan at harvest followed by soaking seed in AA or in SP while soaking seed in water (control) gave the lowest number.

The results concluded that pre-sowing soaking of fuzzy cotton seed in an aqueous filtered solution of 2%calcium superphosphate for 20 hours is the best treatment for good growth and high productivity of cotton (cv. Giza 89).

Keywords: Pre sowing, Soaking, An aqueous, Filtered solution and Cotton .

INTRODUCTION

Attainment of maximum yield of cotton from the unit land area is greatly dependent upon appropriate environment and cultural factors as well as the high yielding variety. Proper stand is considered among the main factors influencing the yield and its components. Hake *et al.* (1991) reported that obtaining an early, uniform stand of healthy seedlings is the first and often the most important step in producing high yield of cotton .

In order to obtain uniform and adequate stands for better cotton yield production, seed germination and seedling emergence must be successful for producing higher stand, better growth and higher yield. Among the so many factors which may achieve such target and proved success by workers on cotton and other crops is soaking of seeds in some nutrients or growth promotors pre-sowing .

As regard to ascorbic acid, Grun *et al.* (1982) reported that ascorbic acid is a product of D-glucose metabolism which affects nutritional cycles activity in higher plants. Ascorbic acid plays an important role in the electron transport system. It is a powerful reducing agent and is reversible converted to dehydroascorbic acid the oxidized product as follow:

$$\text{Ascorbic acid} \rightleftarrows \text{dehydroascorbic acid} + 2H^+ + 2e^-$$

A plant enzyme which catalyzes this reaction is the copper containing enzyme ascorbic acid oxidase (Elwan *et al*, 2000)

As regard to gibberellic acid, Chandola *et al.* (1977) found that soaking cotton seed in 100 ppm GA_3 solution increased germination percentage.

Concerning soaking cotton seed in calcium superphosphate, Kadry *et al.* (1990) found that plant stand at harvest and seed cotton yield / fed. were significantly increased by the pre-sowing seed soaking in calcium superphosphate solution in both seasons .

The purpose of this investigation is to study the importance of pre-sowing soaking cotton seed in solutions of gibberellic acid, ascorbic acid and an aqueous filtered solution of calcium superphosphate and their relation to cotton seed germination, leaf chemical composition , seedling growth, earliness, yield and yield components.

MATERIALS AND METHODS

Two field experiments were carried out at Gemmeiza Agricultural Research Station, Gharbia Governorate, Egypt, during 2000 and 2001 seasons to study the effect of pre-sowing soaking cotton seed in solutions of gibberellic acid (GA_3), ascorbic acid (AA) and filtered solution of calcium superphosphate (SP) in comparison with soaking cotton seed in water (control) on germination, leaf chemical composition, growth, earliness, yield and yield components of the Egyptian cotton *(Gossypium barbadense* L.), cultivar Giza 89 .

A randomized complete block design with four replicates was used in both seasons .

The four treatments evaluated were as follow:

T_1 soaking cotton seed in tap water as a control.

T_2 soaking cotton seed in 100ppm gibberellic acid (GA_3) .

T_3 soaking cotton seed in 1000 ppm ascorbic acid (AA) .

T_4 soaking cotton seed in an aqueous filtered solution of 2% calcium superphosphate "15.5% P_2O_5 " (SP).

In soaking treatments fuzzy seeds of cotton (cv. Giza 89) were soaked in tap water and in solutions of GA_3 , AA and SP for 20 hours before sowing in the field.

The gibberellic acid as GA_3 was obtained from the commercial form ,Berelex .

Ascorbic acid used in this study was as Cevarol form .

Phosphorus fertilizer was added at the rate of 22.5 kg P_2O_5 / fed. as calcium superphosphate (15.5% P_2O_5) during land preparation .

Nitrogen fertilizer was applied as ammonium nitrate (33.5% N) at the rate of 60 kg N/fed. in two equal splits after thinning (36 days after sowing, two plants/ hill or three plants/ hill beside the missing hill) and at the next irrigation.

Potassium fertilizer was added at the rate of 24 kg K_2O / fed. as potassium sulphate (48% K_2O) in one dose with the 1st dose of nitrogen.
The preceding crop was Egyptian clover (berseem), only one cut.

Other cultural practices were carried out as recommended for the traditional cotton planting .

The plot size was 17.55 m^2 (4.5m × 3.9m) including 6 rows in 2000 season and 20.475 m^2 (4.5m × 4.55 m)including 7 rows in 2001 season. The two outer rows were left to avoid border effect. Sowing date was 29 and 26 March for the first and second seasons, respectively, in rows 65 cm apart and hills 25cm apart.
Soil analysis for the two sites is shown in Table 1 .

Traits studied :

A- Germination traits :

In both seasons, days needed to full germination and germination percentage were calculated from all rows of each plot.

B- Chemical composition of the leaf:

After 120 days from sowing, a leaf sample of 20 leaves was taken from the youngest fully matured leaves (4th leaf from the apex of the main stem) from each plot. Leaf sample after preparation is analyzed to determine the nutritional status of cotton plant as follows:

Total N with Micro – Kjeldahl method (Allen, 1953 and Ma and Zauzage, 1942). Other nutrients extraction: total P, K, Ca, Mg,Fe, Mn, Zn and Cu were determined according to the procedures suggested by (Chapman and Pratt, 1978).

C- Growth traits:

At 120 days after sowing, four guarded plants were taken at random from the third row of each plot and were separated to the different organs (leaves, stems, branches, roots, squares, flowers and bolls). The fractions were washed and dried to a constant weight in a forced-air oven at 70° c where the following traits were determined:

- root dry weight / plant, g.
- fruiting parts (fruiting branches, squares, flowers and bolls)dry weight / plant, g.
- total plant dry weight, g.

- Leaf area/plant (LA). The disc method was used to determine LA according to Johnson (1967). The cross sectional area of the punch used was 1.54 cm^2

$$LA / plant = \frac{\text{Leaf dry weight / plant} \times \text{disc area}}{\text{Disc dry weight}} \ (dm^2)$$

- Leaf area index (LAI) was calculated as follow :-

$$LAI = \frac{\text{Leaf area / plant}}{\text{Plant ground area}}$$

Table (1): Analysis (*) of the experimental soil in 2000 and 2001 seasons.

Properties		Methods (References)	2000	2001
Texture		Hydrometer (Bauyoucos, 1954)	Clay loam	Clay loam
PH		1 soil : 2.5 water (Jackson, 1973	8.0	7.9
EC mmhos/cm.			1.1	0.7
$CaCO_3$%		Calcimeter	2.7	2.4
O.M. %		(Walkley and Black, 1934)	1.14	1.05
Total N	Mg/ 100 g soil	Semi-micro Kjeldahl (Piper, 1950)	39.9	36.75
Available N			3.53	2.80
Na HCO_3 – extractable-P		Vanadate- molybdate spectroph-otometer (Olsen *et al.*, 1954)	1.9	1.78
NH_4 – OAC - extractable-K		Flame photometer and Atomic absorption (Chapman and Pratt, 1978)	18.0	15.0
NH_4 – OAC - extractable-Ca			15.0	18.5
NH_4 –OAC - extractable-Mg			8.0	8.3
NH_4 – OAC - extractable-Na			28.0	34.0
DTPA– extractable-Fe	ppm	Atomic absorption spectro- photometer (Lindsay and Norvell, 1978)	4.2	3.8
DTPA– extractable-Mn			1.1	0.7
DTPA– extractable-Zn			0.8	0.6
DTPA– extractable-Cu			0.7	0.9

*** Optimizing of Micronutrient Fertilizers Use Project, National Research Center, Unit of Mariut.**

At harvest, five guarded hills from the second row of each plot were taken at random to determine the following growth traits also:
plant height (cm.), number of internodes/ plant, average internode length (cm.) and number of fruiting branches / plant .

D- Earliness traits:

Earliness was estimated as node number of first fruiting branch and percentage of first pick to total yield

E- Seed cotton yield and its components:

Also, the five guarded hills at harvest were used to determine the following yield components:w
numbers of total and open bolls / plant, boll weight (g) , seed cotton yield / plant (g), lint percentage, seed index (g) and number of seeds / boll.

At harvest also, plant population (thousand / feddan) and seed cotton yield per feddan (*) in kentars (**) were calculated from the inner 4 and 5 rows of each plot in 2000 and 2001 seasons, respectively.

The obtained data were subjected to statistical analysis presented by Le Clerg *et al.* (1966) and the treatments means were compared using LSD at 0.05 level of probability.

RESULTS AND DISCUSSION

A-Germination traits :

Results in Table 2 show that soaking cotton seed in 100 ppm GA_3 or in 2% SP significantly decreased the period from sowing to full germination as compared with control. Also, soaking seed in 1000 ppm AA significantly decreased this period but to a less extent .

In addition, germination percentage was significantly affected by soaking cotton seed treatments, where soaking seed in 100 ppm GA_3 and in 1000 ppm AA gave the highest values of germination percentage followed by that soaking in an aqueous filtered solution of 2% SP as compared with soaking seed in water (control) which gave the lowest value. This result may be due to a direct effect of GA_3 ,AA or SP on the germination process itself or to its effect on stimulation of the germination process or on growth and development of the seedling.

Table(2):Effect of soaking seed treatments on days to full germination and germination percentage in 2000 and 2001 seasons.

Soaking treatments	Days to full germination		Germination %	
	2000	2001	2000	2001
Water (Control)	10.5	9.8	80.9	87.5
GA_3 (100 ppm)	7.5	7.3	97.6	100.0
AA (1000 ppm)	8.5	8.3	97.9	99.3
SP (2%)	7.8	7.5	89.6	96.9
F- Test	**	**	**	**
L.S.D. 0.05	0.7	0.9	6.1	1.7

** indicates $p < 0.01$.
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

(*) One feddan = 4200 . 83 m^2
(**) One kentar = 157.5 kg

Concerning GA_3 effect , many investigators found that (1) in germinating cotton seeds, GA inhibited production of aflotoxin and improved the growth of the cotyledons due to role of GA in protein synthesis (Jones and Black,1967), (2) GA treatment improved development of cotyledons of cotton seedlings (Bradford and Ewing, 1958), (3) the promotive effect of GA_3 could be interpreted on the basis of activating the synthesis of hydrolytic enzymes responsible for providing and mobilization of compounds required as energy source for embryos during their germination (Devlin and Witham, 1983) and (4) soaking cotton seed in 100 ppm GA_3 solution increased germination percentage (Chandola *et al.* 1977).

Concerning AA effect, Grun *et al.,* (1982) found that ascorbic acid activates some enzymes which are important in the regulation of the photosynthetic carbon reduction.

Regarding SP effect, many researchers reported that (1) P is involved in energy transfer processes in both photosynthesis and respiration (Hearn, 1981), (2) phosphate regulates many enzymic processes and phosphorus also acts as an activator of some enzymes which may affect boll formation and stability (Epstein, 1972) and (3) P is considered a main constituent of nucleus proteins, phospholipids, phosphoric ester and other mineral phosphate compounds and its one of the main constituents of the meristematic tissues (El-Fouly and Abd El-Hamed, 1992).

B-Chemical composition of the leaf:

Data in Tables 3 and 4 show that soaking cotton seed treatments gave insignificant effect on leaf macronutrients content (N, P, K, Ca and Mg) but gave a significant effect on leaf micronutrients content (Fe, Zn and Mn) and insignificant effect on Cu content in both seasons. In this respect, Kardy *et al.,* (1990) found that plant N,P and K contents were unaffected by seed soaking in a solution of 0,5 or 10 g calcium superphosphate / litre of water for 20 hours. With regard to the leaf micronutrients content as affected by soaking cotton seed treatments, the highest leaf Zn concentration was obtained from soaking seed in 2% SP followed by soaking seed in 100 ppm GA_3 and in 1000 ppm AA, respectively, while the lowest value of leaf Zn concentration was obtained from soaking seed in water. The highest leaf Mn concentration was obtained from soaking seed in 2% SP followed by soaking seed in 1000 ppm AA and in 100 ppm GA_3, respectively, while the lowest leaf Mn concentration was obtained from soaking seed in water. Leaf Fe concentration did not follow a definite trend in both seasons, where in the first season, the highest value was obtained from soaking seed in 2% SP, but the lowest value was obtained from soaking seed in 1000 ppm AA, while in the second season , the highest value was obtained from soaking seed in 1000 ppm AA, but the lowest value was obtained from soaking seed in water (control).

Table (3): Effect of soaking seed treatments on leaf macronutrients content at 120 days after sowing in 2000 and 2001 seasons.

Soaking treatments	N %		P %		K %		Ca %		Mg %	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Water (Control)	3.87	3.87	0.33	0.34	2.98	2.95	2.50	2.58	0.47	0.41
GA_3 (100 ppm)	3.71	3.87	0.34	0.33	3.13	2.95	2.58	2.45	0.45	0.40
AA (1000 ppm)	4.06	4.06	0.33	0.33	3.00	2.80	2.65	2.63	0.49	0.43
SP (2%)	3.76	3.97	0.34	0.37	3.03	2.98	2.58	2.63	0.49	0.44
F- Test	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
L.S.D. 0.05	--	--	--	--	--	--	--	--	--	--

NS indicates not significant.
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

Table (4): Effect of soaking seed treatments on leaf micronutrients content at 120 days after sowing in 2000 and 2001 seasons.

Soaking treatments	Fe (ppm)		Zn (ppm)		Mn (ppm)		Cu (ppm)	
	2000	2001	2000	2001	2000	2001	2000	2001
Water (Control)	253	222	36.8	32.3	55.3	40.3	12.3	10.3
GA_3 (100 ppm)	248	278	44.3	43.8	56.3	44.0	12.0	10.0
AA (1000 ppm)	220	345	41.8	39.3	56.5	56.0	12.0	10.0
SP (2%)	290	258	45.3	44.8	66.5	56.5	12.0	9.3
F- Test	**	**	**	*	*	**	NS	NS
L.S.D. 0.05	21	15	4.1	7.6	6.7	6.3	--	--

**,* and NS indicate $p < 0.01$, $p < 0.05$ and not significant, respectively
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

The positive response of GA_3 may be due to that GA intensifies an organ ability to function as a nutrient sinck (Addicott and Addicott, 1982).

The positive response of AA may be due to that ascorbic acid enhances nutritional status in higher plants as reported by Grun *et al.*,(1982).

The positive response of SP may be due to the role of phosphorus in physiological processes of cotton plant(Hearn, 1981).

The positive effect of the experienced solutions (GA_3, AA and SP) on leaf micronutrients (Fe, Zn and Mn) content may be due to that the experimental soil contained insufficient amounts of these micronutrients as shown in Table (1), in addition to the positive action of the GA_3, AA and SP on stimulating growth of root as shown in the Table (5), could be increase the plant's capacity to transport nutrients and water. However, the leaf macronutrients (N, P, K, Ca and Mg) and Cu content not significantly affected by the experienced solutions (GA_3, AA and SP) and this may be due to that the available contents of these nutrients in the experimental soil sites as shown in Table (1), in addition to the soil application with mineral N, P and K fertilizers were satisfactory.

C- Growth traits:

Data in Table (5) show that soaking seed treatments exhibited significant differences in dry weights of root, fruiting parts and total parts /

plant as well as leaf area / plant and leaf area index at 120 days after sowing in both seasons. The highest values of these traits were obtained from soaking cotton seed in 2% SP followed by soaking cotton seed in 100 ppm GA_3 and in 1000 ppm AA, respectively, while the lowest values were obtained from soaking cotton seed in water.

Table (5): Effect of soaking seed treatments on some growth traits at 120 days after sowing in 2000 and 2001 seasons.

Soaking treatments	Root dry weight/ plant, g.		Fruiting parts dry weight/ plant, g.		Total dry weight/plant, g.		LA (dm^2/plant)		LAI	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Water (Control)	10.97	13.16	24.41	25.43	96.77	102.70	15.30	15.60	1.88	1.92
GA_3 (100 ppm)	13.13	14.84	27.33	28.63	105.93	117.69	16.84	19.20	2.07	2.36
AA (1000 ppm)	12.77	14.50	25.88	27.03	105.88	116.12	16.63	18.13	2.05	2.23
SP (2%)	14.11	15.94	33.68	36.45	109.81	124.71	17.36	19.62	2.14	2.41
F- Test	**	**	**	**	**	**	**	**	**	**
L.S.D. 0.05	1.05	1.10	4.36	4.24	4.76	3.99	1.09	0.74	0.13	0.09

** indicates $P < 0.01$.
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

Soaking seed treatments had a significant effect on plant height, number of its main stem internodes and number of fruiting branches/ plant in both seasons, but they had no effect on internode length (Table 6). Soaking seed in water (control) significantly reduced plant height at harvest and its main stem internodes as compared with other soaking seed treatments. Also, number of fruiting branches / plant was increased by soaking cotton seed in 100 ppm GA_3 or in 1000 ppm AA and in 2% SP as compared with control (Table 6).

Table (6): Effect of soaking seed treatments on some growth traits at harvest in 2000 and 2001 seasons.

Soaking treatments	Plant height (cm)		No. of main stem internodes/ plant		Internode length (cm)		No. of fruiting branches/ plant	
	2000	2001	2000	2001	2000	2001	2000	2001
Water (Control)	136.0	146.8	22.25	21.17	6.12	6.94	15.0	13.9
GA_3 (100 ppm)	141.8	153.6	23.68	23.25	5.99	6.61	16.2	16.0
AA (1000 ppm)	146.1	155.4	24.78	22.38	5.91	6.95	17.5	15.4
SP (2%)	143.3	152.3	23.98	22.80	5.98	6.69	17.0	15.6
F- Test	*	**	*	**	NS	NS	*	**
L.S.D. 0.05	5.3	2.2	1.40	1.08	--	--	1.5	0.9

**,* and NS indicate $p < 0.01$, $p < 0.05$ and not significant, respectively
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

The favourable effect of GA_3 on growth traits may be due to that ; (1) three important actions of GA at least are appearent as reported by Addicott and Addicott (1982). The first action that GA intensifies an organ ability to function as a nutrient sinck. The asecond action is GA ability to increase the synthesis of IAA in plant tissues. The third action involves acceleration the synthesis of hydrolytic enzymes as amylase and other hydrolytic enzymes in aleurone cells., (2) GA_3 significantly increased the concentration of leaf Zn and Mn as shown in Table 4 and consequently assimilates translocation, (3) or due to its favourable effect in increasing water use efficiency, enzyme activation and role in electron transport system (Shaddad and El-Tayeb,1990), (4) GA_3 cause enlargement of shoot cells and consequently increased plant height (Osborne, 1974) and (5) early emergence of this treatment encourages more production of metabolites synthesized and thus the plant had the chance to bear more fruiting branches. In this concern, Kurdikeri and Kurdikeri (1988) found that soaking cotton seeds in GA increased the plant height, leaf area and DM accumulation at 30 and 45 days after sowing as compared with seeds soaked in water. Becker *et al.* (1997) found that there are an increase in plant height when cotton seeds were applied with ryzup (gibberellic acid).

The positive response on growth traits of soaking seed in AA can be attributed to : (1) its effect on nutritional cycles activity in higher plants (Grun *et al.,* 1982) and (2) early emergence and enhances leaf Mn and Zn concentrations due to this treatment lead to enhancing assimilation and more production of dry matter. The taller plants and the higher number of fruiting branches produced from soaking seed in AA may be due to that the auxinic and antifungal action of AA certainly was reflected on enhancing cell division and nutritional status. However, Elwan *et al.* (2000) found that soaking the faba been seed 4 hours in solution of ascorbic acid AA gave the lowest dry matter.

The beneficial effect of phosphorus on growth traits is mainly due to: (1) early emergence encouraged more production of metabolites synthesized and thus the plants had the chance to bear more fruiting branches, (2) P is considered a main constituent of nucleus proteins, phospholipids, phosphoric ester and other mineral phosphate compounds and one of the main constituent of meristematic tissues (El-Fouly and Abd El-Hamed, 1992) (3) soaking seed in 2% SP enhanced assimilation by increasing leaf Zn and Mn concentrations and improved flow of assimilates as compared with other soaking treatments as shown in Table 4, (4) the influence of P on plant metabolism and development (Epstein, 1972), and (5) P is involved in energy transfer processes in both photosynthesis and respiration (Hearn, 1981).

D-Earliness traits:

Soaking cotton seed treatments did not affect the first fruiting node of plants and earliness % in the two seasons, indicating that these treatments did not affect the position of the first fruiting branch (Table 7).

E-Seed cotton yield and its components :

Soaking cotton seed with the tested treatments (GA_3, AA and SP) had significant effects on numbers of total and open bolls/plant and seed cotton yield / plant in both seasons (Tables 7 and 8). The highest values of these traits were obtained by soaking seed in 2% SP followed by soaking seed in 1000 ppm AA and in 100 ppm GA_3, respectively, but the lowest values were obtained by soaking seed in water treatment .

Table (7): Effect of soaking seed treatments on 1st fruiting node, earliness %, lint %, seed index, number of seeds / boll and number of total bolls/ plant in2000 and 2001 seasons.

Soaking treatments	1st fruiting node		Earliness %		Lint %		Seed index (g)		No. of seeds/ boll		No. of total bolls/ plant	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Water Control)	6.3	6.1	50.6	62.2	36.9	38.6	10.44	9.95	19.1	19.1	15.8	15.3
GA_3 (100 ppm)	6.3	6.0	49.0	63.2	37.0	39.1	10.55	9.93	19.6	19.2	17.5	16.8
AA(1000 ppm)	6.3	6.0	42.9	61.6	37.0	38.8	10.57	10.07	19.7	19.1	17.7	17.6
SP (2%)	6.2	5.9	43.0	61.7	38.0	39.1	10.86	9.97	19.7	19.8	19.1	19.5
F- Test	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	*	*
L.S.D. 0.05	--	--	--	--	--	--	--	--	--	--	1.7	2.7

* and NS indicate $p < 0.05$ and not significant, respectively
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

Soaking seed treatments gave insignificant effect on boll weight, lint %, seed index and number of seeds / boll in both seasons (Tables 7 and 8).

Result
s in Table 8 show that number of plants at harvest / feddan was significantly increased by soaking seed in 100 ppm GA_3 or in 1000 ppm AA or in 2% SP as compared with soaking seed in water (control) in both seasons.

The favourable effect of soaking seed in 100 ppm GA_3 on seed cotton yield components may be due to that, this treatment (1) significantly increased the number of fruiting branches / plant as shown in Table 6 and this mainly affected the number of open bolls / plant,(2) produced the highest number of plants/fed; at harvest which is mainly attributed to the high germination percentage of this treatment and to (3) improved flow of assimilates and accumulated more dry weight in root, fruiting parts and total parts/plant producing more healthy and vigorous plant as shown in Table 5.

Table (8): Effect of soaking seed treatments on seed cotton yield / feddan and its components in 2000 and 2001 seasons.

Soaking treatments	No. of open bolls/ plant		Boll weight, (g)		Seed cotton yield/ plant, (g)		No. of plants/ feddan at harvest, thousand		Seed cotton yield/ feddan, kentar	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Water(Control)	15.5	14.5	2.48	2.42	38.49	35.1	41.103	44.800	10.24	9.92
GA_3(100 ppm)	16.0	16.5	2.42	2.41	38.59	39.74	49.089	50.040	11.57	12.33
AA (1000 ppm)	16.1	17.2	2.44	2.42	39.21	41.60	47.923	48.892	11.16	12.38
SP (2%)	17.4	18.0	2.49	2.46	43.22	44.13	46.040	48.605	12.19	13.14
F- Test	**	*	NS	NS	*	*	**	**	*	**
L.S.D. 0.05	0.7	1.8	--	--	3.4	6.1	3.580	2.004	1.13	1.23

**,* and NS indicate $p < 0.01$, $p < 0.05$ and not significant, respectively
GA_3 = Gibberellic acid AA = Ascorbic acid SP = Superphosphate

The positive effect of soaking seed in 1000 ppm AA on seed cotton yield components may be due to the positive action of ascorbic acid on stimulating growth and leaf nutritional status besides increasing number of fruiting branches / plant (Tables 4,5 and 6) which surely reflected on increasing boll set .

The beneficial effect of soaking seed in 2% SP on seed cotton yield components is mainly attributed to that, this treatment (1) improved plant metabolism which increases boll setting and encourages plant to accumulate more of its total dry weight in fruiting parts (i.e fruiting branches and fruiting organs) as shown in Table 5 and this coincided with higher numbers of fruiting branches and total bolls / plant; (2) increased number of open bolls / plant and optimum boll weight which led to the high increase in seed cotton yield / plant, (3) increased the germination percentage and consequently increased number of plants at harvest / feddan and (4) improved flow of assimilates and accumulated more dry weight in fruiting parts, root and total parts of plant producing more healthy and vigorous plants as shown in Table (5). In this concern Kadry *et al.* (1990), found that soaking seed in a superphosphate solution (0, 5 or 10 g/liter) increased number of open bolls / plant and seed cotton yield / plant in one season only and plant stand at harvest in both seasons, while seed index, boll weight and lint % were unaffected by these treatments .

Soaking cotton seed treatments gave a significant effect on seed cotton yield / fed. in both seasons, in favour of soaking seed in 2% SP (Table 8) which increased seed cotton yield / fed. by 19.04% and 32.46% in the first and second seasons, respectively as compared with soaking seed in water (control). In this concern, Eid and El-Aggory (1985) found that soaking seeds of cotton in 100

ppm GA_3 solution insignificantly increased seed cotton yield. Moreover, Kadry *et al.* (1990), found that soaking seed in a superphosphate solution increased seed cotton yield / fed. in both seasons .

Generally, the increment in seed cotton yield / fed. due to soaking cotton seed in 100 ppm GA_3 or in 1000 ppm AA or in 2% SP as compared with soaking cotton seed in water (control) is attributed mainly to that : (1) these treatments improved cotton plant growth as a result of increasing germination percentage and decreasing the period from sowing to the completion of germination, (2) these treatments increased cotton plant ability to accumulate more dry weight which was parallel to the increase in leaf micro nutrients concentrations, (3) these treatments significantly increased germination percentage and gave the highest numbers of plants per feddan at harvest and (4), these treatments gave favourable effects on plant growth traits i.e. dry weights of root, fruiting parts and total parts / plant, LA / plant, LAI, plant height at harvest and number of fruiting branches /plant which reflect on better growth producing high yield / plant .

This study cleared the following points :

1- Cotton stands that emerge under soaking seed treatments have considerable variability in emergence time .

2- Significant differences in emergence time led to more variability in the growth and development of the subsequent yield .
3- The results might prove the important role of seed cotton yield / plant in determining the final seed cotton yield per unit area. Also, it is clear that sowing to an optimum stand is one of the most important factors beside the better growth of cotton plant to insure satisfactory yield .

CONCLUSION

Finally it could be recommended that pre-sowing fuzzy cotton seed soaking in an aqueous filtered solution of calcium superphosphate at the rate of 2% for 20 hours is considered the best treatment for early emergening seedlings and good germination percentage capable for producing proper stand for better growth and higher yield per plant and per feddan for cotton variety Giza 89.

ACKNOWLEDGEMENT

The authors would like to express their sincere thanks to Prof. Dr Fawzi M. Ghaly, Chairman of Cotton Agricultural Treatments Research Section, Cotton Research Institute, Agricultural Research Center, Ministry of Agric. for suggesting the problem and help.

Deep thanks to all the staff members, at Gemmeiza Agricultural Research Station for providing facilities during this study.

The authors would like to express their gratitude to the project "Micronutrients and Other Plant Nutrition Problems in Egypt" (NRC/GTZ) and the national coordinator Prof. Dr. Mohamed M. El-Fouly for keen help and providing the work facilities.

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استجابة صنف القطن جيزة ٨٩ إلى معاملات نقع البذرة قبل الزراعة

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أجريت تجربتان حقليتان على صنف القطن المصرى جيزة ٨٩ بمحطة البحوث الزراعية بالجميزة – محافظة الغربية خلال موسمى ٢٠٠٠ ، ٢٠٠١م لدراسة تأثير نقع بذرة القطن غير منزوعة الزغب لمدة عشرين ساعة فى ثلاث محاليل مختلفة هى: حمض الجبريلك بتركيز ١٠٠ جزء فى المليون ، حمض الأسكوربيك بتركيز ١٠٠٠ جزء فى المليون وراشح منقوع سوبر فوسفات الكالسيوم بتركيز ٢% وذلك مقارنة بنقع بذرة القطن فى الماء قبل زراعتها وذلك على الصفات التالية: الزمن اللازم لاكتمال الإنبات ، النسبة المئوية للإنبات والتركيب الكيماوى لورقة القطن وصفات النمو والتبكير ومحصول القطن الزهر ومكوناته .

ويمكن ايجاز أهم النتائج المتحصل عليها فيما يلى:

(١)أدى نقع بذرة القطن فى محلول حمض الجبريلك أو راشح منقوع سوبر فوسفات الكالسيوم إلى نقص الفترة من الزراعة حتى اكتمال الإنبات نقصا معنويا وذلك مقارنة بنقع بذرة القطن فى الماء (المقارنة)، كذلك أدى النقع فى محلول حمض الأسكوربيك إلى نقص هذه الفترة أيضا ولكن إلى مدى أقل .

(٢)تأثرت النسبة المئوية للإنبات تأثرا معنويا بمعاملات نقع بذرة القطن حيث أعطى نقع البذرة فىمحلول حمض الجبريلك وفى محلول حمض الأسكوربيك أعلى القيم فى نسبة الإنبات يليها تلك التى نقعت فى راشح منقوع سوبر فوسفات الكالسيوم بينما أعطت معاملة المقارنة أقل قيمة .

(٣) كان لمعاملات نقع بذرة القطن تأثيراً غير معنوى على تركيز الورقة من العناصر الكبرى (النيتروجين ، الفوسفور ، البوتاسيوم ، الكالسيوم والماغنسيوم) وكذلك النحاس عند عمر ١٢٠ يوم، وعلى العكس من ذلك أثرت معاملات نقع بذرة القطن معنوياً على تركيزات الورقة من الزنك والمنجنيز لصالح نقع البذرة فى راشح منقوع سوبر فوسفات الكالسيوم أما تركيز الورقة من الحديد فقد تأثر معنوياً بمعاملات نقع البذرة ولكنه لم يأخذ اتجاه محدد .

(٤) أعطى نقع بذرة القطن فى راشح منقوع سوبر فوسفات الكالسيوم زيادة معنوية فى الوزن الجاف للجذر، الوزن الجاف للأجزاء الثمرية ، الوزن الجاف الكلى للنبات ، المساحة الورقية للنبات ، دليل مساحة الأوراق عند عمر ١٢٠ يوم وذلك مقارنة بنقع بذرة القطن فى الماء (المقارنة).

(٥) أدى نقع بذرة القطن فى الثلاث محاليل المختبرة (حمض الجبريلك ، حمض الأسكوربيك ، سوبر فوسفات الكالسيوم) إلى زيادة معنوية فى كل من طول النبات عند الجنى وعدد سلاميات الساق الرئيسية له وذلك مقارنة بنقع بذرة القطن فى الماء (المقارنة).

(٦) أعطى نقع بذرة القطن فى راشح منقوع سوبر فوسفات الكالسيوم أعلى القيم من عدد اللوز المتفتح على النبات ، محصول القطن الزهر للنبات وكذلك محصول القطن الزهر للفدان فى الموسمين وذلك مقارنة بالمعاملات الأخرى بينما أعطى نقع بذرة القطن فى محلول حمض الجبريلك أكبر عدد من النباتات عند الجنى يليه النقع فى محلول حمض الأسكوربيك والنقع فى راشح منقوع سوبر فوسفات الكالسيوم مقارنة بعدد النباتات الناتجة من معاملة النقع فى الماء (المقارنة) .

(٧) توصى نتائج هذه التجربة بنقع بذرة القطن الزغبية قبل الزراعة فى راشح منقوع سوبر فوسفات الكالسيوم بتركيز ٢% لمدة عشرين ساعة حيث أنها أعطت نموا جيدا وإنتاجية عالية لمحصول القطن صنف جيزة ٨٩ .