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Potassium Fertilization and Micronutrients Foliar Spray Effects on Peanut Productivity and Its Export Traits Using Giza 6 and Nc 9 Peanut Varieties, in Sandy Soils

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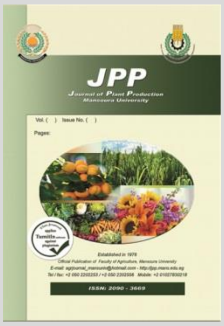

ABSTRACT

In 2019 and 2020 seasons, on sandy soil private farm at Nefisha, Ismailia Governorate using surface irrigation, the effects of eight combinations of four potassium levels (0, 25, 50 and 75 kg K_2O/fad) and two micronutrients foliar spraying doses (*Viz.* with or without micronutrients mixture) on two peanut (*Arachis hypogaea* L.)varieties (*Viz.* Giza 6 and NC 9) were studied. NC 9 variety significantly surpassed Giza-6 variety in all studied characters (plant height, number of branches/plant, fresh straw weight/plant (g) dry straw weight/plant (g) number of pods/plant, weight of pods/plant (g), weight of seeds /plant (g), weight of 100 pods (g), weight of 100 seeds (g), seeds weight per 100 pods (g) and shelling percentage = (seed yield/pod yield) × 100). Plant height, weight of 100 pods, weight of 100 seeds, seeds weight per 100 pods, seed oil percentage and pod, seed, oil, fodder and biological yields/fad were significantly increased by raising potassium fertilization rate up to 75 kg K_2O/fad either under spraying plants with micronutrients or without it.For all aforementioned characters, a significant interaction between potassium fertilization, micronutrients spray and peanut varieties was recorded. The highest values of the previous traits were produced from NC9 variety fertilized with 75 Kg K_2O /fad and sprayed with micronutrients. While the lowest values were achieved from Giza 6 variety unfertilized with potassium and unsprayed by micronutrients. The study recommends planting NC9 cultivar, fertilizing at a rate of 57 kg K_2O/feddan, and foliar spraying with microelements under the conditions of Nafesha area, Ismailia governorate.

Keywords: Peanut, varieties, Potassium, Micronutrients.

INTRODUCTION

Peanut is important export crops in Egyptian markets, Egypt exports about 36 thousand ton from shell groundnut, with a value of about 64.2 million dollars. Cited from General Organization for the Control of Exports and Imports, Trade Agreements Section, Egypt (2021). According to Ministry of Agriculture and Land Reclamation, Egypt, Economic Affairs Sector, the total yield of peanut was 210 thousand ton, came from harvested area about 152 thousand faddan (Hectare = 2.38 Faddan), with productivity about 1.49 ton/fad. (Agricultural Economics Bulletin, 2021).

The European Union countries are the most important markets, as it imported about 74.62% of the Egyptian peanut exports during the period (2018-2021). Cited from Central Agency for Public Mobilization and Statistics, Egypt, the annual bulletin of the agricultural sector indexes, 2021 (C.A.P.M, 2021).

A lot of research work need to be done to increase peanut productivity, specially, under new reclaimed sandy soil conditions, where peanut commonly suffers from deficiency or unavailability of most nutrients. High yielding varieties and fertilization with macro- and micro-nutrients are highly recommended in such case.

The major plant nutrient, potassium plays various metabolic roles in plants. Such as: photosynthesis, protein synthesis, activation of several enzymes and functioning of the stomata. Potassium also presents a beneficial effect on osmoregulation, cation/anion balance, nitrogen fixation and translocation of photosynthetic substances (Bidwell, 1979).

The positive effect of potassium fertilization on peanut were emphasized by Bandopadhyay *et. al.* (2002), Singh (2007), Ayman and Fawzy (2014), Rathore *et. al.* (2014), Hemeid (2015), Truong *et. al.* (2017), Elbaalawy *et. al.* (2018), Meena *et. al.* (2018), Sakarvadia *et. al.* (2019), Hoang *et. al.* (2019) and Afify *et. al.* (2019).

Micronutrients mixture beneficial effect (Fe, Zn, Cu, B, Mn) comes from their great role in promote several metabolic processes, synthesis of chlorophyll, photosynthesis rate, nitrogen fixation by root nodules bacteria, enzymatic activity that positively affect plant growth, yield attributes, yield and quality (Bidwell, 1979).

Micronutrients foliar spray beneficial effects on plant growth, yield attributes, yield and quality of peanut were recorded by Gobarah *et. al.* (2006), Moosapoor *et. al.* (2013), Abd EL-Kader (2013), Arunachalam *et. al.* (2013), Ayman and Fawzy (2014), Nawaz *et. al.* (2014), Abdel-Motagally *et. al.* (2016), Singh *et. al.* (2017), Khan *et. al.* (2017), Hirpara *et. al.* (2017), Saisurya and Ananda (2017), Sharma *et. al.* (2017), Rajitha *et. al.* (2018), El-Metwally *et. al.* (2018), Nakum *et. al.* (2019), Akhtar *et. al.* (2019), Mekdad *et. al.* (2019), Mekki *et. al.* (2019), Yadav *et. al.* (2019) and Abdel-Mawla *et. al.* (2020).

The present work aimed to show how to improve the characteristics of two peanut varieties grown for export purposes in sandy soils at Ismailia Governorate; through

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application of potassium fertilization and spraying with micronutrients.

MATERIALS AND METHODS

In 2019 and 2020 seasons, on sandy soil private farm at Nefisha, Ismailia Governorate using surface irrigation, the effects of eight combinations of four potassium levels (0, 25, 50 and 75 kg K2O/fad) and two micronutrients foliar spraying doses (Viz. with or without micronutrients mixture) on two peanut (*Arachis hypogaea* L.) varieties (Viz. Giza 6 and NC 9) were studied. Table (1) shows the pH and available elements values for the sandy soil experimental site.

Table 1. pH and available elements values for the sandy soil experimental site.

	1st Season	2nd Season		1st Season	2nd Season
pH values	7.86	7.89	Available K	285 ppm	256 ppm
Available N	77.8 ppm	70.3 ppm	Organic matter	0.603 %	0.552 %
Available P	41.5 ppm	35.9 ppm			

16 treatment combinations were tested, in each experiment. Two peanut varieties and eight fertilization sets. They were combinations of four potassium levels and two micronutrients spraying treatments.

The experimental layout was split plots with three replicates. Two peanut varieties assigned randomly in the main plots, while the eight fertilization treatments were distributed randomly in the sub-plots. Each plot had five ridges (furrows) with 4.5 m long and 60 cm in width. The experimental unit area was 13.5 m^2. The hills in Giza 6 variety as erect cv. (V1) was 20 cm apart from each other, while in NC 9 variety as spread cv. (V2) was 25 cm. The preceding crop was wheat in both growing seasons. The sowing date was May 20th. Peanut seeds were sown on one side of the ridge. Before sowing, Arabic gum coated seeds were mixed with the suitable nitrogen fixing bacteria to nodulate the peanut roots. Thinning peanut plants was done after 14 days from sowing to two plants per hill.

Eight combinations of four potassium levels namely 0, 25, 50 and 75 kg K_2O/fad and two micronutrients spraying treatments namely mixture of micronutrients or without (tap water). Potassium fertilization doses in the form of potassium sulphate (48% K_2O) were added at three equal doses, after 30, 60 and 90 days from sowing. Mixture of micronutrients in solution form was carried out as foliar application using 1cm^3/L at 30 and 60 days from sowing with volume spray of 200 and 300 L/ fad, respectively. Mixture of micronutrients contributes Fe 13.5%, Zn 2.5%, Mn 2.5%, Cu 3% and B 0.5% in a chelate form (EDTA).

Nitrogen basal dose as ammonium sulphate (20.5% N) at rate of 30 kg N/fad was applied after thinning. A basal dose of calcium superphosphate (15.5% P_2O_5) at rate of 300 kg/fad was added during soil preparing. Standard agricultural practices for growing peanut crop at Ismailia Governorate were followed.

Harvest was done 120 days after sowing in Giza 6 cultivar, while NC 9 cultivar had been harvested 140 days after sowing.

At harvest, 10 samples of guarded plants were taken randomly from the two inner ridges in each sub-plot to determine the following characters: 1- plant height; 2- number of branches/plant; 3- fresh straw weight/plant (g); 4- dry straw weight/plant (g); 5- number of pods/plant; 6- weight of pods/plant (g); 7- weight of seeds /plant (g); 8- weight of 100 pods (g); 9- weight of 100 seeds (g); 10- seeds weight per 100 pods (g) and 11- shelling percentage = (seed yield/pod yield) × 100.

Fodder yield (ton/fad), biological yield (kg/fad), pod yield (Ardab/fad) and seed yield (kg/fad) were estimated from the plants of the three inner ridges in each sub-plot and the yields per fad were calculated.

Determination of seed oil% was done by using the Soxhelt continuous extraction apparatus with petroleum ether as an organic solvent according to A.O.A.C. (1980). Oil yield (kg/fad) was estimated by multiplying seed oil percentage and seed yield/fad.

Random seeds samples of each sub-plot used to determine total concentration of Aflatoxins using HPLC device. Also, types of Aflatoxins (B1, B2, G1 and G2) concentrations (µg/kg) as results of HPLC equipment analysis in 2019 and 2020 seasons were conducted as described by A.O.A.C. (2016).

Analysis of variance for the collected data was done according to Snedecor and Cochran (1982). Comparison between treatments means differences were calculated by Duncan's Multiple Range Test (Duncan, 1955). According to Duncan's Multiple Range Test at the 5% level of significance (Duncan, 1955), means followed by the same alphabetical letters are not statistically different. Means of the interaction were compared using the Least Significant Difference (LSD) test (Waller and Duncan, 1969).

RESULTS AND DISCUSSION

A-Effect of varieties :

Tables (2 and 3) reveal that NC9 variety surpassed insignificantly Giza 6 cv. in plant height and number of branches/plant, in the two seasons. Similar results were reported by Abd-Alla (2004), Mohamed (2010), Abdel-Haliem *et. al.* (2015) and Saisurya and Ananda (2017).

Plants of NC9 variety outweighed significantly Giza 6 cv. in fresh and dry straw weight /plant in the two seasons (Table 2); which is in harmony with those reported by Yasein (2005), Abdel-Haliem *et. al*. (2015), Zaki *et. al.* (2017) and Samaha *et. al*. (2019).

Tables (3, 4 and 5) show that NC9 variety significantly exceeded Giza 6 cv. in number of pods/plant, weight of pods/plant, weight of seeds/ plant, shelling percentage and weight of 100 seeds, for the two seasons. These results are in accordance with those recorded by Abd-Alla (2004), Ali *et. al.* (2004), Mohamed (2010), Abdel-Haliem *et. al*. (2015) and Mahrous *et. al.* (2015).

Data presented in Tables (4 and 5) show that NC9 variety statistically outweighed Giza 6 cv. in weight of 100 pods and seeds weight per 100 pods in the two seasons. Similar results confirmed by Abd-Alla (2004), Ali *et. al.* (2004), Mohamed (2010), Abdel-Haliem *et. al.* (2015) and Mahrous *et. al.* (2015).

Table (6) illustrate that NC9 variety significantly outyielded Giza 6 cv. in pod yield/fad and seed yield/fad, in the two seasons. The superiority of NC9 variety in seed yield/fad compared to Giza 6 cv. might be due to that NC9 variety had more number and weight of pods/plant, weight of 100 seeds, shelling percentage and weight of seeds/plant. NC9 variety surpassed Giza 6 cv. in pod yield /fad by 10.22 % and 7.77 %, in the two seasons. Confirming results were emphasized by Ali *et. al.* (2004), Mohamed (2010), Rajendra *et.al.* (2013), Mahrous *et. al.* (2015), Zaki *et. al.* (2017) and Abdel-Mawla *et. al.* (2020).

It is obvious from Tables (5 and 6) that NC9 variety significantly outyielded Giza 6 cv. in fodder yield/ fad and biological yield/ fad and that was true during both seasons. This result might be due to the superiority of NC9 in fresh and dry weight of straw per plant as well as pod yield/ fad and that is consequently related to growth type of both cultivars (Giza 6 as erect type and NC9 as spread one) that are in harmony with those recorded by Mohamed (2010), Rajendra *et.al.* (2013) and Zaki *et. al.* (2017).

Table (7) indicate that NC9 variety overcome significantly Giza 6 in seed oil percentage in the two growing seasons. Similar results were obtained by Abd-Alla (2004), Tian *et.al.* (2013), Mahrous *et. al.* (2015), Zaki *et. al.* (2017) and Samaha *et. al.*(2019).

Table (7) shows clearly that NC9 variety surpassed significantly Giza 6 cv. in oil yield/ fad by 30.69 % and 27.90 % in the two growing seasons, respectively. These results confirmed by Ali *et. al.* (2004) and Abdel-Mawla *et. al.* (2020).

Also, Table (7) demonstrate that total concentration of Aflatoxin in seeds of two peanut varieties did not affect significantly by cultivar genetic constitution in the two seasons. Seeds of NC9 variety had total concentration of Aflatoxin less than seeds of Giza 6 cv. in the first season but the difference was not significant. Azzam and Khalifa (2020) revealed that Gregory and Ismalila 1 varieties recorded the least percentage of *Aspergillus flavus* occurrences in seeds.

B- Effect of potassium fertilization:

Table (2) reveals that increasing potassium fertilization rate up to 75 Kg K_2O/fad significantly increased plant height and dry straw weight /plant of peanut and that was true either under spraying plants with micronutrients or without it in the two growing seasons 2019 and 2020. These results are in accordance with those recorded by Gobarah *et. al.* (2006), Meena *et. al.* (2018) and Afify *et. al.* (2019).

Data presented in Tables (2 and 3) illustrate that potassium levels of 50 and 75 Kg K_2O/fad resulted statistically similar fresh straw weight /plant, number of branches/plant and number of pods/plant of peanut but significantly higher than 25 Kg K_2O/fad and unfertilized control and that was true under spraying plants with micronutrients or without it in the two seasons. Such results are in harmony with those reported by Bandopadhyay *et. al.* (2002), Gobarah *et. al.* (2006), Singh (2007), Rathore *et. al.* (2014) Truong *et. al.* (2017), Meena *et. al.* (2018) and Afify *et. al.* (2019).

Table (3) reveals that weight of pods/plant of peanut increased statistically by increasing potassium fertilization rate up to 50 Kg K_2O/fad under spraying plants with micronutrients or without it in the first season and up to 75 Kg K_2O/fad in the second season. The works of Elbaalawy *et. al.* (2018) and Afify *et. al.* (2019) confirming the present results.

Table (4) reveals that increasing potassium fertilization rate from 0 to 25 and 50 Kg K_2O/fad significantly increased weight of seeds/plant of peanut under spraying plants with micronutrients or without it, the two seasons. The positive effect of potassium on weight of seeds per plant was expected since potassium increases number of pods per plant, weight of pods/plant, shelling percentage and hundred seed weight**.** Confirming results were illustrated by Hemeid (2015), Elbaalawy *et. al.* (2018) and Afify *et. al.* (2019).

Both 75 and 50 Kg K_2O/fad without significant difference between them exceeded significantly unfertilized control in shelling percentage of peanut under spraying plants with micronutrients or without it, in the two seasons as shown in Table (4). These results agree with those recorded by Meena *et. al.* (2018).

Tables (4 and 5) demonstrates that weight of 100 pods, weight of 100 seeds and seeds weight per 100 pods of peanut were significantly increased by raising potassium fertilization level up to 75 Kg K_2O/fad under spraying plants with micronutrients or without it, in the two seasons. The results of Bandopadhyay *et. al.* (2002), Gobarah *et. al.* (2006), Rathore *et. al.* (2014), Hemeid (2015) and Meena *et. al.* (2018) are in a good line with the results of the present study.

Table (6) show that under foliar spray with micronutrients or without it (tap water), pod yield/ fad of peanut was significantly increased by raising potassium fertilization level up to 75 Kg K_2O/fad in the first season and up to 50 Kg K_2O/fad in the second season. These results were expected since potassium increases pods number/ plant and weight of pods/plant. Similar results were detected by Bandopadhyay *et. al.* (2002), Gobarah *et. al.* (2006), Ayman and Fawzy (2014), Meena *et. al.* (2018), Afify *et. al.* (2019) and Sakarvadia *et. al.* (2019).

Also, Table (6) indicates that increasing potassium fertilization rate up to 75 Kg K_2O/fad significantly increased seed yield/fad of peanut under spraying plants with micronutrients or without it and that held true in the two seasons. The positive effect of potassium on seed yield/fad might be due to that potassium increases number of pods/plant, weight of pods/plant, hundred seed weight and seeds weight/plant consequently increases seed yield per fad of peanut. Results of Bandopadhyay *et. al.* (2002), Ayman and Fawzy (2014), Elbaalawy *et. al.* (2018), Meena *et. al.* (2018) and Afify *et. al.* (2019) are in accordance with those of the present work.

Tables (5 and 6) illustrate that fodder yield/fad and biological yield/fad of peanut were significantly increased by raising potassium fertilization level up to 75 Kg K_2O/fad either under spraying plants with micronutrients or without it and that was true in the two seasons. The reason for the superiority of potassium fertilization at the high level in increasing fodder yield/ fad may be due to that potassium increases number of branches/plant as well as fresh and dry straw weight /plant. The positive effect of potassium fertilization on biological yield/fad might be due to increase pod yield/ fad, seed yield per fad and fodder yield/ fad. Similar results were emphasized by Bandopadhyay *et. al.* (2002), Ayman and Fawzy (2014), Meena *et. al.* (2018) and Sakarvadia *et. al.* (2019).

Table (7) shows that increasing potassium fertilization level up to 75 Kg K_2O /fad significantly increased seed oil percentage and oil yield/fad of peanut under spraying plants with micronutrients or without it and that held true in the two seasons. The increasing in oil yield/fad by applying the highest potassium fertilization level might be due to that potassium increases seed yield per fad and seed oil percentage; which are in accordance with Bandopadhyay *et. al.* (2002) and Afify *et. al.* (2019).

Also, Table (7) indicates that applying 75 Kg K_2O/fad resulted lowest total concentration of Aflatoxin in peanut seeds compared to unfertilized control treatment under spraying plants with micronutrients or without it, in the two seasons. Application of high levels of potassium fertilization (50 and 75 kg K_2O/fad) and foliar spray with micronutrients were more effective in reducing total concentration of Aflatoxin in peanut seeds in the two seasons. Azzam and Khalifa (2020) detected similar results.

C- Effect of micronutrients :

Data in Table (2) show that in unfertilized potassium plots (control), spraying peanut plants with micronutrients significantly increased plant height compared to unsprayed one in the two seasons. Confirming results were emphasized by Arunachalam *et. al*. (2013), Abdel-Motagally *et. al.* (2016), Saisurya and Ananda (2017) and El-Metwally *et. al*. (2018).

Data in Tables (2 and 3) illustrate that in zero potassium plots, fresh straw weight/plant, dry straw weight/plant, number of branches/plant, number of pods/plant and weight of pods/plant of peanut were increased by spraying peanut plants with micronutrients compared to unsprayed plants but the increase was not significant in the two seasons. These findings are in accordance with those mentioned by Abdel-Motagally *et. al.* (2016), Khan *et. al.* (2017), Hirpara *et. al.* (2017), El-Metwally *et. al*. (2018), Rajitha *et. al.* (2018), Mekdad *et. al*. (2019), Mekki *et. al.* (2019), Nakum *et. al.* (2019) and Yadav *et. al*. (2019).

Tables (4 and 5) show that in unfertilized potassium plots (control), peanut plants sprayed with micronutrients overcome insignificantly unsprayed plants in weight of seeds/plant, shelling percentage, weight of 100 seeds, seeds weight per 100 pods, in the two seasons. The same situation, also, noticed by Arunachalam *et. al*. (2013), Abdel-Motagally *et. al.* (2016), Hirpara *et. al.* (2017), Singh *et. al.* (2017), El-Metwally *et. al*. (2018), Mekdad *et. al*. (2019) and Mekki *et. al.* (2019).

Data presented in Table (4) illustrate that in zero potassium plots, spraying peanut plants with micronutrients significantly increased weight of 100 pods compared to unsprayed one, in the two seasons. Confirming results were emphasized by Hirpara *et. al.* (2017), Rajitha *et. al.* (2018) and Mekdad *et. al*. (2019).

Moreover, results in Table (5) reveal that in unfertilized potassium plots (control), peanut plants sprayed with micronutrients outyielded significantly unsprayed one in fodder yield/fad and that was true in the two seasons. Ayman and Fawzy (2014) and Khan *et. al.* (2017) reported similar results.

Data in Table (6) demonstrate that in zero potassium plots, spraying peanut plants with micronutrients induced insignificant increases in pod yield/fad, seed yield/fad and biological yield/fad compared to unsprayed plants, in the two seasons. Such results are in a good line with the results of Arunachalam *et. al*. (2013), Moosapoor *et. al*. (2013), Ayman and Fawzy (2014), Nawaz *et. al*. (2014), Abdel-Motagally *et. al.* (2016), Khan *et. al.* (2017), Saisurya and Ananda (2017), Singh *et. al.* (2017), Rajitha *et. al.* (2018), Mekdad *et. al.* (2019) and Nakum *et. al.* (2019).

Table (8) shows that in unfertilized potassium plots (control), seed oil percentage and oil yield/fad of peanut were increased by spraying peanut plants with micronutrients compared to unsprayed plants but the increases were not significant in the two seasons except oil yield/fad in the second season where the increase was significant. Similar results confirmed by Abd EL-Kader (2013), Abdel-Motagally *et. al.* (2016), Saisurya and Ananda (2017), Sharma *et. al*. (2017), and Mekdad *et. al.* (2019).

Total concentration of Aflatoxin in peanut seeds did not affect significantly by spraying plants with micronutrients in the two seasons (Table 7). Similar results confirmed by Azzam and Khalifa (2020).

D- Effect of the interaction:-

Analysis of variance for the studied characters illustrates a significant interaction between potassium fertilization, spraying with micronutrients and peanut varieties on number of pods/plant, weight of pods/plant, weight of seeds/plant, weight of 100 pods, weight of 100 seeds, seeds weight per 100 pods, pod yield/fad, seed yield/fad, fodder yield/fad, seed oil percentage and oil yield/fad, in the two seasons (Tables 2- 7).

The highest values of all aforementioned characters were produced from NC9 variety fertilized with 75 Kg K_2O/fad and sprayed with micronutrients. While the lowest values were achieved from Giza 6 variety unfertilized potassium and unsprayed micronutrients, in the two seasons (Table 8). Similar results were detected by Salama (2002), Gobarah *et. al.* (2006), Mohamed *et. al.* (2008), Ebrahim *et. al.* (2016), Zaki *et. al.* (2018) and Mekki *et. al.* (2019).

Table 2. Effect of foliar application of micronutrients and potassium fertilization levels on plant height, fresh straw weight /plant and dry straw weight /plant of two peanut varieties in 2019 and 2020 seasons.

Treatments		Plant height (cm)		Fresh straw weight / plant (g)		Dry straw weight /plant (g)	
		2019	2020	2019	2020	2019	2020
Varieties	Giza 6	61.9 a	60.9 a	197.8 b	197.8 b	152.0 b	150.1 b
	NC9	63.2 a	63.5 a	337.8 a	332.2 a	263.8 a	261.4 a
F. test		NS	NS	*	*	*	*
K_2O (Kg/fad)							
Without foliar micronutrients	0	56.2 g	55.0 f	208.0 c	208.4 b	156.4 e	156.6 e
	25	60.4 ef	60.1 d	233.4 bc	234.2 b	178.4 de	178.0 de
	50	64.3 cd	63.6 c	290.2 a	291.0 a	226.0 c	225.2 c
	75	66.8 ab	66.5 ab	321.7 a	322.3 a	253.1 ab	251.9 ab
With foliar micronutrients	0	59.2 f	58.1 e	209.0 bc	209.2 b	162.3 de	163.2 de
	25	62.5 de	61.6 d	236.0 bc	236.0 b	182.8 d	182.2 d
	50	65.9 bc	65.2 bc	292.3 a	293.0 a	231.2 bc	230.5 bc
	75	68.6 a	67.5 a	323.3 a	324.0 a	258.7 a	258.2 a
F. test		*	*	*	*	*	*
Interaction effect							
V xK xM		*	*	*	*	*	*

Table 3. Effect of foliar application of micronutrients and potassium fertilization levels on number of branches/plant, number of pods/plant and weight of pods/plant of two peanut varieties in 2019 and 2020 seasons.

Treatments		Number of branches/plant		Number of pods/plant		Weight of pods/plant (g)	
		2019	2020	2019	2020	2019	2020
Varieties	Giza 6	58.8 a	58.2 a	45.0 b	46.9 b	42.0 b	43.3 b
	NC9	59.7 a	59.3 a	52.9 a	55.2 a	54.7 a	54.9 a
F. test		NS	NS	*	*	*	*
K_2O (Kg/fad)							
Without foliar micronutrients	0	54.1 e	54.1 f	37.8 f	40.1 d	38.1 d	53.1 e
	25	57.0 de	57.6 de	45.3 d	47.1 c	42.3 cd	60.3 c
	50	60.4 bc	60.1 bcd	51.6 bc	55.9 b	52.4 b	75.9 b
	75	62.1 ab	62.0 ab	54.8 ab	58.8 ab	56.1 ab	82.0 a
With foliar micronutrients	0	55.9 de	56.1 ef	40.1 ef	42.5 d	40.1 d	56.2 de
	25	58.5 cd	58.8 cde	49.0 cd	49.5 c	44.6 c	62.8 c
	50	62.1 ab	61.8 abc	55.1 ab	57.3 ab	54.8 ab	78.8 b
	75	63.8 a	63.4 a	57.8 a	59.8 a	58.9 a	83.3 a
F. test		*	*	*	*	*	*
Interaction effect V xK xM		*	*	*	*	*	*

Table 4. Effect of foliar application of micronutrients and potassium fertilization levels on weight of seeds/ plant, shelling percentage and weight of 100 pods of two peanut varieties in 2019 and 2020 seasons.

Treatments		Weight of seeds/ plant (g)		Shelling percentage		Weight of 100 pods (g)	
		2019	2020	2019	2020	2019	2020
Varieties	Giza 6	32.4 b	32.7 b	74.9 b	74.9 b	157.6 b	158.8 b
	NC9	44.3 a	45.2 a	82.0 a	81.9 a	217.2 a	218.8 a
F. test		*	*	*	*	*	*
K_2O (Kg/fad)							
Without foliar micronutrients	0	29.7 d	29.2 d	76.7 d	76.6 d	151.0 h	153.2 h
	25	31.5 cd	33.1 cd	77.7 bcd	77.6 cd	169.1 f	170.9 f
	50	41.3 b	42.4 b	78.7 abc	78.9 abc	195.9 d	198.4 d
	75	45.2 ab	45.8 ab	79.6 ab	80.0 ab	212.0 b	213.5 b
With foliar micronutrients	0	32.5 cd	31.5 d	77.1 cd	77.2 d	162.0 g	162.7 g
	25	34.9 c	36.0 c	78.2 bcd	78.2 bcd	179.7 e	181.0 e
	50	43.8 ab	45.5 ab	79.3 ab	79.3 abc	206.1 c	207.6 c
	75	47.8 a	48.6 a	80.3 a	80.3 a	223.1 a	223.1 a
F. test		*	*	*	*	*	*
Interaction effect V xK xM		*	*	*	*	*	*

Table 5. Effect of foliar application of micronutrients and potassium fertilization levels on weight of 100 seeds, seeds weight per 100 pods and fodder yield/ fad of two peanut varieties in 2019 and 2020 seasons.

Treatments		Weight of 100 seeds (g)		Seeds weight per 100 pods (g)		Fodder yield (ton/fed)	
		2019	2020	2019	2020	2019	2020
Varieties	Giza 6	70.6 b	71.5 b	118.3b	119.3 b	7.0 b	7.0 b
	NC9	88.7 a	86.8 a	178.5a	179.7 a	9.4 a	9.5 a
F. test		*	*	*	*	*	*
K_2O (Kg/fad)							
Without foliar micronutrients	0	64.1 e	63.8 d	117.2 f	118.3 f	6.0 e	6.1 e
	25	71.8 cd	71.8 c	132.3 e	133.6 e	7.1 d	7.2 cd
	50	81.4 b	80.8 b	155.7 c	157.4 c	8.8 b	8.6 b
	75	93.4 a	93.2 a	169.7 b	171.3 b	9.9 a	9.7 a
With foliar micronutrients	0	68.0 de	67.2 d	126.2 e f	126.4 ef	6.7 d	6.8 d
	25	75.4 c	74.8 c	141.5 d	142.5 d	7.8 c	7.8 c
	50	85.9 b	84.7 b	164.6 bc	165.9 b	9.1 b	9.3 b
	75	97.1 a	96.9 a	180.3 a	180.4 a	10.2 a	10.3 a
F. test		*	*	*	*	*	*
Interaction effect V xK xM		*	*	*	*	*	*

Table 6. Effect of foliar application of micronutrients and potassium fertilization levels on pod yield/ fad, seed yield/ fad and biological yield/ fad of two peanut varieties in 2019 and 2020 seasons.

Treatments		Pod yield (Ardab/fad)		Seed yield (Kg/fad)		Biological yield (Kg/fad)	
		2019	2020	2019	2020	2019	2020
Varieties	Giza 6	17.6 b	18.0 b	996.4 b	1019.1 b	7881 b	7853 b
	NC9	19.4 a	19.4 a	1197.9 a	1198.1 a	10507 a	10453 a
F. test		*	*	*	*	*	*
K_2O (Kg/fad)							
Without foliar micronutrients	0	14.5 f	14.3 e	835.4 f	829.1 f	7099 d	7082 d
	25	16.2 e	16.2 cd	951.3 e	951.3 de	8248 c	8218 c
	50	19.7 c	20.8 b	1171.1 c	1229.6 c	10044 b	10076 b
	75	21.5 ab	21.7 ab	1288.9 b	1301.2 b	11141 a	11129 a
With foliar micronutrients	0	15.3 ef	15.3 de	889.8 ef	892.9 ef	7221 d	7144 d
	25	17.4 d	16.7 c	1024.9 d	1013.9 d	8386 c	8290 c
	50	20.8 bc	21.0 ab	1243.9 b	1281.7 bc	10152 b	10110 b
	75	22.7 a	22.0 a	1372.1 a	1369.3 a	11263 a	11179 a
F. test		*	*	*	*	*	*
Interaction effect V xK xM		*	*	*	*	*	*

Table 8. Yield, its attributes and quality of peanut as significantly affected by the interaction between varieties, potassium fertilization and micronutrients in 2019 and 2020 seasons.

Character	Season	Highest value	Treatment	Lowest value	Treatment
Number of pods per plant	2019 2020	61.6 64.0	NC9 x75 Kg K_2O /fad x micro	32.6 35.0	Giza 6 x 0 Kg K_2O /fad x without micro
Weight of pods per plant (g)	2019 2020	65.4 65.5	NC9 x75 Kg K_2O /fad x micro	32.6 32.4	Giza 6 x 0 Kg K_2O /fad x without micro
Weight of seeds per plant (g)	2019 2020	53.8 55.7	NC9 x75 Kg K_2O /fad x micro	24.4 24.3	Giza 6 x 0 Kg K_2O /fad x without micro
Weight of 100 pods(g)	2019 2020	254.6 254.4	NC9 x75 Kg K_2O /fad x micro	126.3 127.8	Giza 6 x 0 Kg K_2O /fad x without micro
Weight of 100 seeds (g)	2019 2020	109.1 107.7	NC9 x75 Kg K_2O /fad x micro	56.3 57.5	Giza 6 x 0 Kg K_2O /fad x without micro
Seeds weight per 100 pods (g)	2019 2020	213.4 213.4	NC9 x75 Kg K_2O /fad x micro	92.5 93.5	Giza 6 x 0 Kg K_2O /fad x without micro
Pod yield (Ardab/fad)	2019 2020	23.6 22.2	NC9 x75 Kg K_2O /fad x micro	13.5 13.4	Giza 6 x 0 Kg K_2O /fad x without micro
Seed yield (Kg/fad)	2019 2020	1484.5 1475.1	NC9 x75 Kg K_2O /fad x micro	742.3 735.8	Giza 6 x 0 Kg K_2O /fad x without micro
Fodder yield (ton/fed)	2019 2020	11.7 11.8	NC9 x75 Kg K_2O /fad x micro	5.1 5.2	Giza 6 x 0 Kg K_2O /fad x without micro
Seed oil percentage	2019 2020	53.8 53.8	NC9 x75 Kg K_2O /fad x micro	46.1 46.1	Giza 6 x 0 Kg K_2O /fad x without micro
Oil yield (Kg/fad)	2019 2020	802.9 794.6	NC9 x75 Kg K_2O /fad x micro	342.2 339.6	Giza 6 x 0 Kg K_2O /fad x without micro

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تأثير التسميد بالبوتاسيوم والرش الورقي للمغذيات الدقيقة على إنتاجية الفول السوداني وصفاته التصديرية باستخدام أصناف الفول السوداني جيزة 6 و NC 9 ، في التربة الرملية

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الملخص

أجريت تجربتان حقليتان في موسمي 2019 و2020 بمنطقة نفيشه بمحافظة الإسماعيلية لدراسة تأثير ثماني معاملات من التسميد عبارة عن توافيق معدلات التسميد البوتاسى (صفر , 25 , 50 , 75 كجم بو$_2$أ / فدان) ومعاملتين الرش الورقي بالعناصر الصغرى (رش ، وبدون رش) على صنفين من الفول السوداني (جيزة 6 ، NC9). وتتلخص النتائج كما يلى:- 1- تفوق الصنف NC 9 معنويا على صنف جيزة 6 في جميع الصفات المدروسة. 2- أدى زيادة معدل التسميد البوتاسى حتى 75 كجم بو$_2$أ / فدان سواء مع الرش بالعناصر الصغرى أو عدم الرش إلى زيادة معنوية في ارتفاع النبات , وزن 100 قرن و بذرة , وزن بذور 100 قرن , النسبة المئوية للزيت بالبذور , محصول القرون, والبذور، والقش, والمحصول البيولوجي و محصول الزيت /فدان. 3- يوجد تأثير معنوي لتفاعل التسميد البوتاسى والرش الورقي بالعناصر الصغرى والأصناف على كل الصفات المدروسة. تم الحصول على أعلى القيم لجميع الصفات مع الصنف NC9 ، التسميد بمعدل 75 كجم بو$_2$أ / فدان والرش الورقي بالعناصر الصغرى. بينما سجلت أقل القيم مع الصنف جيزة 6 بدون تسميد بالبوتاسيوم او رش بالعناصر الصغرى. وتوصي الدراسة بزراعة الصنف NC9 والتسميد بمعدل 57 كجم بو$_2$أ / فدان والرش الورقي بالعناصر الصغرى تحت ظروف منطقه نفيشه بمحافظة الإسماعيلية.

الكلمات الدالة: الفول السودانى , التسميد البوتاسى , الرش بالعناصر الصغرى.