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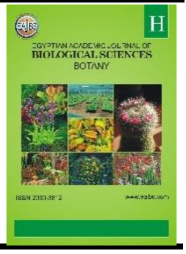

Productivity of Some Onion Varieties Under Different Silicates Forms in Relation to Thrips (*Thrips tabaci L.*) Infection

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ABSTRACT

The two field experimentswere carried out at the Experimental Farm, Faculty of Agriculture, Saba Basha, Alexandria University, Alexandria Governorate, Egypt, during the two winter seasons of 2018/2019 and 2019/2020 to study the effect of foilar application of silicon forms on yield, quality and trips population of some onion varieties. This experiment was laid out in split-plot design in three replications in both seasons. The main plot was four onion varieties named; Giza Red, Giza 20, Hybrid Red (Al-Hamra), and Hybrid Yellow (Alabkar), while the subplots were differentsilicon forms (water = control, nano silicon, silicon in tablets, and silicon in powder form) was in both seasons. The obtained results showed that onion varieties differed in the studied characters, foliar application of the different forms of silicon significantly affected yield, and trips population, as well as the interaction between varieties and Si form, was significant in both seasons. Whereas on the other hand, Giza Red recorded the highest values of the studied parameters followed by Giza 20 as compared with the other varieties, also silicon in form nanoparticles (Si NPs)increased growth, yield quality, and decreased population of thrips in onion in both seasons. The interaction between Si forms and onion varieties was significant on all the studied characters, where planting Giza 20 with foliar application of nanoparticles (Si NPs) form recorded the highest values also reduced the population of thrips in the two cropping seasons under the study conditions.

INTRODUCTION

Onion (*Allium cepa* L)) is one of the most important crops grown in Egypt. The area harvested was about 63,723 (ha), while the national production was about 2304210 tons (FAO, 2018).

Onion has been considered as asupply of micro food, minerals, salts, vitamins, and as well as other nutrients. It has been noted that onions are subjected to many diseases due to theattack of insect pests that may cause areduction in the yield and quality of crops(Lorbeer *et al.*, 2002). Thrips are consideredthemost damaging pests of onion and related allium crops worldwide. Thrips are slender like in shape and nearly 2mm long in their body size. They can be seen when onions are cultivated and can be found in warmer regions (Brewster, 2008). Seven species of thrips were listed as pests of allium crops of which *Thrips tabaci* is found to be asevere pest of allium crops.

Silicon (Si) is the second most abundant element in the lithosphere. Soils commonly contain as much as 30 % Si, the majority of which is found in minerals and rocks. In plants, the element Si is recognized as a “beneficial quasi-essential” mineral nutrient. It is taken up by the plant roots and trans-located to aerial parts through transpiration streams. Soluble Si in the plant system attracts natural predators and parasitoids during pest attack and consequently increases biological control. Although, a large set of data shows that Si provides anatural defense against pest attack, theapplication of Si as a pest control agent has not gained much attention from the scientists, policymakers, and farming communities. Here, current knowledge regarding Si-mediated plant defense to pest attack is reviewed. Si-application tends to reduce pest infestations and may provide a sustainable environment-friendly integrated strategy as an alternative to extensive pesticide use (Bakhat *et al*., 2018). Foliar sprays with silicates are effective as pesticides, while (stabilized) silicic acid sprays increase growth and yield and decrease biotic and abiotic stresses. The limited data on foliar silica-nano sprays show a tendency to decrease biotic stress and to stimulate a limited increase in growth and yield (Henk 2018). The application of silicon in crops provides a viable component of integrated management of insect pests and diseases because it leaves no pesticide residues in food or the environment, and it can be easily integrated with other pest management practices as biological control (Laing *et al*., 2015).

Nanotechnology has become one of the most promising new approaches for pest control in recent years. Nanoparticles represent a new generation of environmental remediation technologies that could provide acost-effective solution to some of the most challenging environmental clean-up problems (Chinnamuthu and Boopathi, 2009). Silica nanoparticles (Si NPs) have been evaluated against the cotton leafworm Spodoptera littoralis (El-Bendary and El-helaly, 2013), the tomato borer Tuta absoluta, the stored grain insect-pest [the rice moth] corcyra cephalonica (Vani and Brindhaa, 2013), the pink bollworm pectinophora gossypiella (Derbalah *et al*., 2014) and the lesser grain borer beetle rhyzopertha dominica and the red flour beetle *Tribolium castaneum* (El-Samahy *et al*., 2014).

The aims of this study were to:

1- Study the effect of different forms of silicon (Si) on yield and thrips infection of some onion varieties.
2- Study the interaction effect between silicon forms and onion varieties to determine the best combination, which will increase the production and quality of onion and avoid exposure of the crop to thrips infection.

MATERIALS AND METHODS

Two field experiments were conducted out at the experimental farm, Faculty of Agriculture, Saba Basha, Alexandria University, Alexandria Governorate, Egypt, during the two seasons of 2018/2019 and 2019/2020 to study the effect of foliar application of different forms of silicon (Si) concentrations on some onion varieties productivity and Thrips infection under thesoil as affected by salts.

The physical and chemical properties of experimental soil are presented in Table 1 which according tothemethod described by Page *et al.* (1982).

This experiment was laid out in split-plot design in three replications in both seasons. The main plot was four onion varieties names as follow; Giza Red, Giza 20, Hybrid Red (Al Hamra) and Hybrid Yellow (Alabkar), while the subplots weredifferentsilicon forms (water = control, nano silicon (Si NPs), silicon in tablets, and silicon in powder form) in both seasons.

Table 1. Soil physical and chemical properties of experimental sites in both seasons

Soil properties	Seasons	
	2018/ 2019	2019/2020
A- Mechanical analysis		
Sand	14.5	14.7
Silt	42.1	42.1
Clay	43.4	43.2
Soil texture	Clay loam	Clay loam
B- Chemical properties		
pH (1:1)	7.7	7.6
EC (1:1) dS/m	3.4	3.5
1- Soluble cations (1:2)		
K^+	1.4	1.5
Ca^{++}	14.2	15.4
Mg^{++}	11.3	11.5
Na^+	13.6	13.8
2- Soluble anions (1:2)		
CO^-_3+ HCO^-_3	2.8	2.9
CL^-	19.7	19.8
SO^-_4	12.4	12.5
Calcium carbonate (%)	6.7	6.9
Total nitrogen (%)	1.1	1.2
Available P (mg/kg)	3.7	3.6
Organic matter (%)	1.5	1.6

Recommended doses of nitrogen, phosphorus, and potassium fertilizers were added at the rate of 90 kg N, 45 kg P_2O_5, and 48 kg KO_2/fed.

The foliar application of Si nanoparticles at the rate of 250 cm/100 L water, Si form in tablets at the rate of (100 g/100 L water) and Si in anormal form at the rate of 100 cm/100 L water at three times 30, 45, and 60 days after transplanting.

All other cultural practices for onion production in clay soil in Alexandria conditions were followed accordingtotheMinistry of Agriculture and Land Reclamation.

Twenty randomly selected plants were taken from each plot in both seasons to measure: Plant height (cm), fresh weight (g/plant), number of green leaves/plant, total chlorophyll content, dry weight (g)/plant, total yield (tons/fed.), marketable yield (t/fed.), average bulb weight (g), and bulb total soluble solids (TSS).

Population density of Thrips was survived at 75, 105, 120, and 135 days after transplanting in both seasons.

All collected data were subjected to analysis of variance according to Gomez and Gomez (1984). All statistical analysis was performed using analysis of variance technique by means of CoStat (2005) computer softwarepackage.

RESULTS AND DISCUSSION

The results obtained in Tables (2 and 3) showed the significant effect of silicon forms on plant height (cm), fresh weight (g/plant), dry weight (g/plant), number of leaves/plant, and leaf length (cm), bulb weight (g), bulb yield (t/fed), total soluble substances (TSS), K (%) and Si contents (mg/kg) in 2018/2019 and 2019/2020 seasons.

Concerning the four onion varieties, Tables (2 and 3) revealed that onion varieties differed in all the studied characters i.e. plant height (cm), fresh weight (g/plant), dry weight (g/plant), number of leaves/plant and leaf length (cm), bulb yield (t/fed), total soluble substances (TSS), K (%) and Si contents (mg/kg) except bulb weight (g) in both seasons, whereas Giza Red variety the tallest plants and the highest mean values of dry weight, bulb yield, TSS (%), K (%) and Si content, on the other hand, Giza 20 recorded the highest values of dry weight, number of leaves/plant, and leaf length with no significant with Giza Red variety and Giza 20 variety as compared with the other two varieties hybrid Red and Yellow in both seasons. These results are in agreement with those indicated by Fasika *et al*. (2008); Shah *et al.* (2012); Abou Azoom *et al.* (2014); Devi *et al.* (2014); Das *et al.* (2015); Singh *et al.* (2015); Solanki *et al.* (2015) they found that there was asignificant difference among the studied varieties in growth, yield and quality characters that due to the genetic factors.

In respect of the effect of silicon forms on onion attributes, results in Tables (2 and 3) indicated that application of Si in nano- form as nanoparticles (Si Nps) recorded the highest mean values of the all studied characters i.e. plant height (cm), fresh weight (g/plant), dry weight (g/plant), number of leaves/plant and leaf length (cm), bulb weight (g), bulb yield (t/fed), total soluble substances (TSS), K (%) and Si contents (mg/kg) in comparison with the other from followed by Si in Tablets/powder as compared with the control treatments in both seasons. Thisincrease of these characters due to the vital role of Si in thegrowth and productivity of the field crop especially under salinity condition. These findings results in harmony with those recorded by Clarkson (2011); Liu *et al*. (2011);Ahmad *et al*. (2013); Mikhael *et al*. (2018); Shedeed (2018)theywho detected that Si application increased growth and yield in various field crop by enhancing utilization rate and absorbing ability of nutrients and increasing photosynthesis efficiency.

Table 2. Plant attributes of onion varieties as affected by silicon forms (Si) and their interaction in both seasons

Treatment	Plant height (cm)		Fresh weight (g/plant)		Dry weight (g/plant)		Number of leaves/plants		Leaf length (cm)	
	Seasons									
	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
A- Onion varieties										
Giza Red	58.3	54.4	104.3	102.4	117.6	113.4	8.6	8.2	26.5	28.3
Giza 20	55.5	51.3	125.0	108.0	111.2	109.2	8.8	8.3	27.6	27.6
Hybrid Red	56.5	46.7	148.1	142.2	77.3	76.9	8.8	9.6	24.3	24.9
Hybrid Yellow	52.8	47.3	143.2	142.1	97.2	98.8	9.1	9.1	34.7	41.1
$LSD_{0.05\ (A)}$	3.9	2.5	13.9	7.8	14.2	13.5	0.1	0.7	6.4	2.3
B- Si forms										
Control	53.5	45.3	120.2	106.9	88.5	85.8	7.6	8.0	30.4	30.0
Si nanoparticles	57.1	55.8	155.4	153.6	121.3	115.6	10.4	9.9	24.9	28.1
Si Tablets	55.7	47.3	118.8	117.6	96.9	92.4	8.5	8.8	30.1	32.4
Si Powder	56.8	51.3	126.2	136.7	96.5	104.4	8.8	8.5	27.8	31.4
$LSD_{0.05\ (B)}$	3.0	3.6	15.7	9.7	10.8	7.05	0.9	0.9	2.9	3.2
A x B	*	*	*	*	*	*	*	*	*	*

* and ns: significant and not significant difference at 0.05 level of probability.

Table 3. Plant attributes of onion varieties as affected by silicon forms (Si) and their interaction in both seasons

Treatment	Bulb weight (g)		Bulb yield (t/fed)		TSS (%)		K (%)		Si (mg/kg)	
	Seasons									
	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
A- Onion varieties										
Giza Red	183.3	183.6	9.4	9.2	14.4	14.5	1.6	1.6	35.5	35.9
Giza 20	171.8	178.1	8.7	8.7	14.3	14.4	1.5	1.5	35.2	35.6
Hybrid Red	171.6	182.5	8.5	8.9	13.7	13.6	1.4	1.5	32.8	33.5
Hybrid Yellow	186.7	182.4	9.2	9.1	13.8	13.6	1.5	1.5	33.0	33.6
$LSD_{0.05\ (A)}$	ns	ns	0.3	0.4	0.4	0.8	0.1	0.1	2.2	2.0
B- Si forms										
Control	152.1	158.7	7.6	7.6	12.7	12.6	1.2	1.2	27.6	28.9
Si NPs	202.4	203.8	10.0	10.0	14.8	14.9	1.7	1.8	37.3	37.2
Si Tablets	180.2	181.2	8.9	9.2	14.6	14.5	1.5	1.6	37.2	37.2
Si Powder	178.2	182.9	8.9	9.1	13.9	13.9	1.6	1.6	34.5	35.4
$LSD_{0.05\ (B)}$	12.7	8.6	0.4	0.4	0.9	0.8	0.2	0.2	1.9	2.3
A x B	*	*	*	*	*	*	*	*	*	*

* and ns: significant and not significant difference at 0.05 level of probability

Concerningtheinteraction between onion varieties and Si forms, the results obtained in Tables (4 and 5) reported there was significant interaction between the two factors (Varieties x Si forms) in all the studied character such as plant height (cm), fresh weight (g/plant), dry weight (g/plant), number of leaves/plant and leaf length (cm), bulb weight (g), bulb yield (t/fed), total soluble substances (TSS), K (%) and Si contents (mg/kg) in both seasons, where the cultivar Giza Red + Si NPs recorded the highest values of plant height, and the tallest leaf, meanwhile Giza 20 + NPs of Si gave the highest mean values of fresh weight (g/plant), dry weight (g/plant), number of leaves/plant, bulb weight (g), bulb yield (t/fed), total soluble substances (TSS), K (%) and Si contents (mg/kg) in both seasons. On the other hand, sowing Hybrid Red + Control (water spray) recorded the lowest ones in both seasons.

The results in Table (6) showed Thrips population density (Adult and nymph) of onion varieties as affected by silicon forms (Si) and their interaction in both seasons. Where the onion varieties showed significant response for Thrips population in this respect Giza Red and Giza 20 gave the lowed numbers of Thrips comparing with the other varieties in both seasons.

Belong to the effect of Si forms, application of Si in anyform as Si NPs, Si Powder, and Si Tablets made asignificant reduction of the Thrips population density (Adult and nymph) in both seasons (Table 6). The reduction in thepopulation of Thrips due to the main role of Si for control of insects, in this respect Takahashi (1996) and Epstein (1999) reported that silicon deposited in the epidermal tissue may have several functions including support and protection as a mechanical barrier against pathogen and herbivore invasions. Also, Belanger *et al*. (1995); Ma and Takahashi (2002); Meyer and Keeping, (2005) indicated that silicon applications can contribute significantly to reducing damage due to pests and diseases. On the other hand, Bucchus (2010) found that the silicon application improved the resistance to pests, disease, and other environmental stresses.Wheras, Qari *et* *al.* (2013) found that The initial reduction% of the *T. tabaci* population in onion fields after application of a high concentration of nanoparticles (Aerosil 200® (4 ml/l)) and 8000 ppm concentrations of the four plant extracts were 83.66, 81.08, 86.92, 74.49, and 91.38%, respectively, whereas their persistence effects were 73.18, 67.78, 71.46, 66.94, and 78.29%, respectively. Furthermore, the total chlorophyll contents in onions treated with the nanoparticles and four plant extracts were 1.35, 1.17, 1.09, 1.07, and 1.18 mg/g, respectively; additionally, the concentrations of phenols were 4.65, 3.15, 3.15, 2.85, and 3.70 mg/g in onions treated with *C. camphora, M. chamomilla, M. arvensis, T. foenum-graecum*, and Aerosil 200®, respectively

Moreover, there was asignificant interaction between verities and Si forms in the two seasons (Table 6).

Table 4. Interaction effect between Si forms and onion varieties in both seasons

Treatments		Plant height (cm)		Fresh weight (g/plant)		Dry weight (g/plant)		Number of leaves/plants		Leaf length (cm)	
Onion varieties	Si forms	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
Giza Red	Control	51.7	47.0	159.3	116.0	110.1	96.7	7.3	8.0	29.8	28.7
	Si NPs	56.3	51.0	186.0	190.0	144.8	144.6	11.3	10.0	24.6	28.8
	Si Tablets	60.7	45.7	121.7	126.0	111.1	101.7	8.7	9.7	28.9	26.9
	Si Powder	60.7	45.3	130.3	136.7	104.3	110.6	9.0	8.7	22.89	28.8
Giza 20	Control	55.0	54.7	116.7	119.7	93.3	96.3	8.0	7.7	29.3	25.8
	Si NPs	61.3	60.3	180.3	171.3	140.0	120.3	10.3	10.0	21.2	22.7
	Si Tablets	48.0	42.7	151.7	146.0	115.4	112.6	8.7	7.7	32.9	32.1
	Si Powder	57.7	47.3	120.0	131.3	96.0	107.33	8.3	8.0	27.0	29.8
Hybrid Red	Control	56.7	47.7	88.0	74.0	110.6	118.2	8.3	10.0	22.6	22.3
	Si NPs	58.0	52.3	121.0	120.0	59.7	56.4	9.3	10.0	21.4	22.3
	Si Tablets	56.0	43.7	106.3	110.3	92.1	87.5	8.7	10.0	26.3	28.5
	Si Powder	55.3	43.0	102.0	105.3	82.1	82.3	9.0	8.3	26.9	26.2
Hybrid Yellow	Control	50.7	56.0	116.7	118.0	75.2	81.5	6.7	6.3	40.1	43.2
	Si NPs	52.7	59.3	135.3	133.0	90.7	93.9	10.7	9.7	32.2	38.3
	Si Tablets	58.0	57.0	95.7	88.0	108.3	109.9	8.0	7.7	32.1	42.1
	Si Powder	49.7	45.3	152.3	173.3	79.2	73.1	9.0	9.0	34.2	40.8
$LSD_{0.05\ (A \times B)}$		6.3	7.2	31.5	19.0	21.5	14.1	1.9	1.9	5.9	6.5

Table 5. Interaction effect between Si forms and onion varieties in both seasons

Treatments		Bulb weight (g)		Bulb yield (t/fed)		TSS (%)		K (%)		Si (mg/kg)	
Onion varieties	Si forms	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
Giza Red	Control	156.3	156.7	7.7	7.7	12.7	12.6	1.3	1.3	23.3	24.3
	Si NPs	208.7	212.0	10.7	10.8	15.1	15.3	1.8	1.9	42.7	43.5
	Si Tablets	173.0	176.0	9.1	9.1	13.9	14.2	1.7	1.7	40.0	38.3
	Si Powder	196.3	189.6	9.1	9.1	14.4	14.6	1.6	1.6	36.0	36.3
Giza 20	Control	141.7	150.2	7.1	7.1	12.7	12.6	1.1	1.1	30.0	33.1
	Si NPs	194.3	203.7	9.7	9.7	14.9	15.3	1.6	1.8	37.3	36.8
	Si Tablets	179.0	178.3	8.9	9.0	15.9	15.4	1.4	1.4	36.9	37.7
	Si Powder	172.3	180.0	9.1	9.1	13.9	14.2	1.7	1.6	36.7	36.3
Hybrid Red	Control	138.7	162.6	7.4	7.4	11.9	12.2	1.1	1.1	28.9	30.6
	Si NPs	199.1	191.7	9.7	9.7	14.6	14.1	1.6	1.7	34.7	35.0
	Si Tablets	180.0	187.3	9.4	9.4	14.2	14.0	1.4	1.5	35.3	35.8
	Si Powder	168.7	188.4	9.5	9.5	14.8	14.1	1.6	1.6	32.3	32.3
Hybrid Yellow	Control	171.7	165.3	8.3	8.3	13.4	13.1	1.2	1.3	28.1	27.5
	Si NPs	207.3	207.7	10.1	10.1	14.7	14.3	1.6	1.5	34.3	33.3
	Si Tablets	188.7	183.0	9.2	9.2	14.2	14.4	1.5	1.7	36.5	36.9
	Si Powder	178.1	173.6	8.7	8.7	12.8	12.7	1.6	1.6	33.0	36.7
$LSD_{0.05\ (A \times B)}$		25.3	17.2	0.9	0.8	1.9	1.5	0.3	0.3	3.8	4.6

Table 6. Thrips population density (Adult and nymph) of onion varieties as affected by silicon forms (Si) and their interaction in both seasons.

Treatment	Days after transplanting (DAT)																			
	75				90				105				120				135			
	Seasons																			
	2018/2019		2019/2020		2018/2019		2019/2020		2018/2019		2019/2020		2018/2019		2019/2020		2018/2019		2019/2020	
	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph	Adult	Nymph
A- Onion varieties																				
Giza Red	6.9	15.8	7.2	6.7	8.9	8.0	3.3	7.3	1.4	3.4	4.3	2.9	4.5	0.9	3.0	1.4	2.4	0.9	3.2	1.2
Giza 20	6.6	12.4	5.8	7.5	5.6	8.3	3.2	10.9	2.2	7.1	3.7	3.5	3.3	1.5	3.3	4.9	2.3	0.9	3.1	1.4
Hybrid Red	11.7	26.3	12.4	21.6	10.9	12.7	5.8	17.9	6.4	18.4	4.4	4.7	9.1	12.9	4.6	1.0	3.8	3.4	4.6	2.6
Hybrid Yellow	18.4	24.8	20.8	42.3	24.1	25.4	8.8	25.6	12.0	15.4	9.9	5.8	12.4	15.1	4.4	2.1	5.1	4.2	3.5	2.6
$LSD_{0.05\ (A)}$	1.0	2.9	3.2	5.2	7.0	4.2	3.2	4.4	3.5	2.3	3.2	0.8	1.6	1.5	0.9	1.6	0.9	1.4	1.5	0.7
B- Si forms																				
Control	15.9	35.6	15.8	26.3	13.2	24.7	7.6	26.1	8.6	17.4	8.0	9.7	13.1	11.9	5.9	4.1	6.9	1.1	5.8	4.3
Si NPs	9.0	17.2	11.4	14.0	11.6	9.9	5.3	10.6	3.1	7.1	5.9	1.5	3.4	4.8	3.6	1.1	1.7	3.2	3.3	0.9
Si Tablets	10.1	15.9	10.1	20.5	10.9	9.9	4.8	11.6	5.6	9.9	4.3	2.3	6.4	5.4	2.6	2.0	1.9	2.2	2.1	1.1
Si Powder	8.6	10.7	8.9	17.2	13.7	10.0	3.4	13.4	4.7	9.9	4.0	3.5	6.5	8.3	3.3	2.2	3.1	2.9	3.1	1.5
$LSD_{0.05\ (B)}$	2.0	8.3	3.2	15.0	3.9	5.1	1.6	2.3	1.8	3.4	2.4	1.1	2.0	1.8	1.6	1.1	1.5	1.9	1.5	0.7
A x B	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

* and ns: significant and not significant differenceat 0.05 level of probability.

CONCLUSION:

This study demonstrated that onion varieties differed in all the studied characters i.e. growth, productivity, and bulbs quality whereas Giza 111 recorded the highest values of growth, yield, and quality characters. Foliar application of nano- silicon (Si NPs) led to improve total yield and bulb quality of onion. As well as, Giza 111 + Si NPs improved vegetative growth and yield of onion plants under study conditions atAlexandria Governorate, Egypt

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ARABIC SUMMARY

أنتاجية بعض أصناف البصل تحت صور سليكات مختلفة وعلاقتها بالأصابة بالتربس

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أجريت هذه الدراسة فى مزرعة كلية الزراعة – سابا باشا بمنطقة ابيس – محافظة الأسكندرية خلال الموسم الشتوي لعامى 2019/2018 و 2020/2019 و ذلك لدراسة دراسة تأثير التسميد الورقي وببعض صور السيليكات علي انتاجية بعض أصناف البصل ودراسة تأثير بعض صور السيليكات علي حشرة التربس ودراسة التداخل بين بعض أصناف البصل وصور السيليكات. وإقيمت تجارب حقلية بإستخدام تصميم القطع المنشقة مرة واحدة في ثلاثة مكررات بحيث أن القطع الرئيسية وزعت بها أربعة أصناف من البصل و هى جيزة احمر ، جيزة أبيض ، هجين أحمر (الحمراء) ، هجين أصفر(أبكار) وفي القطع الشقية وزعت صور السيليكات (كنترول (الرش بالماء ، نانو سليكون ، أقراص السليكون فوارة ، سليكون في صورة بودرة).

أ- الصفات النمو والمحصول:

- اختلفت أصناف البصل الأربعة فيما بينها في صفات النمو والمحصول والجودة مثل أرتفاع النبات والوزن الطازج (جم/نبات) و الوزن الجاف للنبات (بالجم) وعدد الأوراق للنبات وطول الورقة وزن البصلة (بالجم) ومحصول البصل (طن/فدان) و مجموع المواد الصلبة الكلية (%) و محتوي البصل من البوتاسيوم (%) و محتوى البصيلات من السليكون (ملجم/كجم) وايضاً اختلفت في استجابتها للاصابة بالتربس (عدد الحشرات من الحوريات والحشرات الكاملة) خلال موسمي الزراعة حيث حقق صنف جيزة أحمر و جيزة 20 أعلى متوسطات قيم في صفات النمو والمحصول والجودة وأقل اصابة بحشرات التربس خلال موسمى الدراسة.
- أثر الرش الورقي بالصور المختلفة للسليكون تأثيراً معنوياً على صفات النمو والمحصول والجودة للبصل خلال موسمي الزراعة حيث أوضحت النتائج أن الرش الورقي للسليكون في صورة نانو (جزيئات منتهية الصغر) أعطت أعلى متوسطات قيم للصفات المدروسة وحقق أقل عدد حشرات من التربس (الكاملة أو الحوريات) متبوعاً في صورة الأقراص الفوارة من السليكون في حين أن الكنترول (الرش بالماء) حقق أقل متوسطات قيم لهذه الصفات وكانت هذه النباتات أكثر إصابة بحشرات التربس الكاملة والحوريات خلال موسمي الزراعة.

- كان التداخل بين عاملي الدراسة (الأصناف وصور السليكون) معنوياً في كل الصفات المدروسة حيث سجل الرش الورقي لصنف جيزة أحمر بصورة النانو سليكون أعلى متوسطات قيم في جميع الصفات كما سجل أقل كثافة عددية لحشرة التربس (البالغة والحوريات) مقارنة بباقي المعاملات في حين ان صنف هجين أحمر مع الكنترول سجل أقل متوسطات قيم للصفات المدروسة وأعلى كثافة عددية لحشرة التربس (الحوريات و الحشرة الكاملة) خلال موسمي الدراسة.

التوصية:

توصى الدراسة بزراعة صنف جيزة أحمر أو جيزة 20 مع الرش الورقي بمعدلات الورقي للسليكون في الصورة النانوية حيث أن ذلك حقق أعلى نمو ومحصول وجودة وقللت من الاصابة بحشرة التربس خلال موسمي الدراسة وتحت ظروف منطقة أبيس – محافظة الأسكندرية – مصر وظروف المناطق المماثلة لها.