

**ROLE OF SUGARCANE VARIETIES AND POTASSIUM FERTILIZER
IN THE MANAGEMENT OF LESSER SUGARCANE BORER, *CHILO
AGAMEMNON* BLEZYNSKI AND RED STRIPED SOFT SCALE,
PULVINARIA TENUIVALVATA (NEWSTEAD)**

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Abstract

Field experiments were carried out at Edfu district, Aswan governorate throughout the two successive sugarcane seasons (2004 / 05 and 2005 / 06) to study the effect of two levels of potassium fertilizer (0 and 50 kg/fed.) and two sugarcane varieties as well as their interactions on the infestation level by *C. agamemnon* and *P. tenuivalvata* and on yield.

The results clearly showed that, using the GT 9/54 variety and 50 kg potassium applied with the second dose of recommended nitrogen decreased the infestation by *C. agamemnon* and resulted in the increasing of sugarcane

yield (70.73 ton/fed.) . While using the PH 8013 variety and 50 kg potassium ,by the same way, decreased the population density of *P. tenuivalvata* and also increased the yield (69.83 ton/fed.).

INTRODUCTION

In Egypt, the total sugarcane (*Saccharum officinarum* L.) cultivated area reached about 312 thousand feddans, about 80 % of them are concentrated around sugarcane mills in middle and upper Egypt, produce about one million ton of sugar represents about 70 % of the total locally sugar production (1.4 million tons), (Besheit *et al.* 2002). Aswan governorate is the 2nd district for sugarcane plantation, cultivates about 25 % of the total sugarcane area in Egypt.

Lesser sugarcane borer, *Chilo agamemnon* Bles. (Lepidoptera: Pyralidae) showed different symptoms of infestation circular tunnels, infested joints and stalk breakage. The stalk breakage up to 1% caused loss in cane yield from 0.65 to 0.67 % (Kira and El-Sherif,1973). Under severe attack(more than10 holes/stalk), this insect causes reduction in sugarcane yield, % brix and % sucrose (Tohamy,1999).

Red striped soft scale, *Pulvinaria tenuivalvata* (Newstead) (Homoptera: Coccidae) is recently considered the key pests of sugarcane production in Egypt, by sucking the cell sap of the leaves and excrete a large amount of honeydew that covers the leaves and encourages the growth of sooty mould fungus ,which affect on

photosynthesis and respiration processes of sugarcane plants. The outbreaks of this pest have occurred causing a severe damage and economic yield losses up to 69.9% and reduction in chemical properties of sugarcane juice (Ali *et al.*,2000, Shalaby,2002, El-Khouly *et al.* ,2004, and Salama *et al.*, 2006).

The chemical control of the insect pests had caused environmental pollution and serious harmful effects to humans, domestic animals and natural enemies. The efficiency of agricultural practices on the population density could be taken into consideration as a mean of control measure of the major sugarcane insect pests(Ali *et al.*,2000, Shalaby,2002, Eid *et al.*, 2005 and Salama *et al.*, 2005).

It is noticed that , the farmers don't add the potassium fertilizer because it casts much money. So, in this work the recommended dose (50kg / fed) of potassium fertilizer was applied with the second dose of the nitrogen fertilizer compared with zero level rate to clarify the effects of this fertilizer in addition to varieties on the level of infestation by *C.agamemnon* and *P.tenuivalvata* and yield.

MATERIALS AND METHODS

An experiment area was chosen at Edfo district, Aswan governorate, throughout two sugarcane seasons (2004/05 and 2005/06) to obtain plant cane and first ratoon, respectively. This work aimed to study effects of two potassium fertilizer levels (without and with 50 Kg/fed.) on infestation level with *C.agamemnon* and *P.tenuivalvata* in Giza- Taiwan (GT9/54) and Philippine (PH8013) sugarcane varieties in addition to study their effects on the obtained yield.

The experiment was planted on March 15, 2004 (spring plantation) using a split plot design with four replications. The two levels of potassium fertilizer were allocated on the main plots , while the two varieties (GT 9/54 and PH 8013) were laid out as sub- plots . Each sub- plot measured 42 m² had 6 ridges with 7 m long and one meter apart. No insecticidal applications were applied.

All potassium fertilizer dose was added, as potassium sulphate (48%K₂O), with the second dose of nitrogen fertilizer. The other normal cultural practices were applied as recommended. Harvest was carried out on the next March 15, of both seasons.

To determine the sugarcane borer infestation, at harvest time, samples of 25 stalks each were randomly selected from each sub-plot, cleaned and then inspected

carefully to count total number of free and bored joints and number of bored and girdilled stalks using formula of Mendes *et al.*(1980) was used to determine percentages of these figures.

As for red striped soft scale population density, samples of 30 leaves collected from 5 plants (as 2 leaves / plant level) were inspected in the field from each subplot after 100 days from planting and continued at 15 days intervals during the period of the experiment . All nymphs and adults found on both leaf surfaces were counted and recorded to express the population size of this insect.

T- test was used to determine the significance between the different mean treatments.

RESULTS AND DISCUSSION

Results obtained from the different experiments were as follows

1-Variety performance

Data represented in Table (1) showed that insignificant difference was detected in the yield of the two varieties in the two seasons. On the other side, significant differences were observed in *C. agamemnon* infestation and highly significant differences in *P. tenuivalvata* population in both seasons. Also, GT 9/54 was less susceptible to *C. agamemnon* infestation with 48.9, 5.6 and 8.4 % in the first season and 62.3, 7.3 and 14.0 %, in the second season for bored stalks, bored joints and breakage stalks, respectively. Mean infestation percentages of the two seasons were,55.6,6.5 and 11.2, respectively. On the contrary PH 8013 variety was more susceptible, received higher infestations with averages of 66.7,9.4 and 20.9 %,for the same figures, respectively.

As for *P. tenuivalvata* population, the data found in Table (1) indicated that, GT 9/54 variety was more preferable in both seasons, harboured 211.7 and 173.3 with an average of 192.5 individuals / 120 leaves. The another variety (PH 8013) was less susceptible, received 138.3 and 119.6 with an average 129.0 individuals / 120 leaves during the same seasons, respectively. GT 9/54 variety showed a higher tolerance against *P. tenuivalvata* infestation, so it produced a heavier yield averaged 67.64ton/fed compared with 66.44 ton/fed. for PH variety.

These results are in agreement with findings of Khewa (2001), GT 9/54, had the lowest percentage of infested joints and girdled plants between five tested sugarcane varieties. On the other hand, Eid *et al.* (2005) showed that,GT9/54 had a higher susceptible to *C. agagemnon* infestation then PH 8013 variety. The variety of GT 9/54 was significantly the most susceptible to *P. tenuivalvata* infestation, while PH 8013 variety was the least susceptible, Salama *et al.* (2005).

2-Effect of potassium fertilizer

As shown in Table (1), the two levels of potassium fertilizer showed highly significant differences each of *C. agagemnon* and *P. tenuivalvata* infestation. While significant differences were observed in yield of both seasons, the lowest infestation by *C. agagemnon* was recorded in the treatment of 50kg / fed.,showing 42.3, 5.5 and 9.1 % for bored stalks ,bored joints and breakage stalks % in the first season and 56.8, 6.3 and 14.4%, respectively in the second season. The untreated treatment recorded 64.4, 9.0 and 16.9 % in the first season and 81.1, 10.8 and 23.8% respectively in the second season for the same respective figures, respectively.

With regard to *P. tenuivalvata* population, data presented in the same table indicated that ,the 50 kg/fed treatment recorded lower infestation reaching 130.8 and 112.0 with an average 121.4 individuals /120 leaves during 2004/05 and 2005/06 seasons, respectively, compared with 200.0 individuals /120 leaves in case of check.

Concerning the yield 50kg K treatment, significantly gave the higher yield, 69.33 and 71.23 with an average of 70.28 ton/fed. The check weights were lower, 62.42 and 65.18 with average of 63.80 ton/fed. These results are agree with those obtained by several authors used the same dose of K, Verma *et al.* (1991), obtained 73.00 ton/ha., Abou-Salama (1995) take also the highest yield. Singh *et al.* (1995) found that sugarcane receiving 50kg K /ha recorded significantly better yield cane. Application of 96 kg K /fed, attained significant increase in cane yield over that 48 kg K /fed., but not over that of none application treatments (Abdel-Lahi,1999). The potassium application with nitrogen fertilization decreased the sugarcane borers infestation(Tohamy,1999 and Ali *et al.*, 2001), but it reported that decreased the density of *P. tenuivalvata*, Shalaby (2002). Also, Salama *et al.* (2005) noticed that using 100 kg potassium sulphate (48%) /fed was considered the proper agricultural

practices which decreased the population of *P. tenuivalvata* and resulted in the increasing of sugarcane yield.

3-Interactions

Data presented in Table (2) and Figs. (1&2) indicated that, the interaction between the two sugarcane varieties and the two levels of potassium fertilizer showed significant differences in the all studied seasons.

The lower infestations with *C. agamemnon* and *P. tenuivalvata* were observed under 50 kg of potassium in both tested varieties. Regardless of variety, mean percent infestations ranged 43.4-55.7, 4.7-7.2 and 8.0-15.4 for bored stalks, bored joints and girdled canes, respectively, at 50 kg K/ fed rate. These percentages were higher with 0.0 kg K/fed level; 67.8-77.8, 8.3-11.6 and 14.4-26.3 respectively. *P. tenuivalvata* counts were also lower, with 50kg h/fed rate, since ranged 91.3-151.6 opposite 166.7-233.5 insects/120 leaves in the check. In the same time, heavier yield (69.83-70.73 ton /fed.) observed under higher rate of potassium.

The data in the same table and figures revealed that, in the check higher infestations by *C. agamemnon* was observed with PH 8013 than with GT 9/54 variety. On the other hand, an opposite observation was happened with *P. tenuivalvata*, density was higher (233.5) with GT 9/54 variety than that in the another variety (166.7). The lowest density was under 50 kg of potassium /fed with PH 8013 variety, 84.1-98.4 individuals/120 leaves. Data illustrated in Figs (1&2) confirmed *P. tenuivalvata* results and showed that, its population had only one climax under all treatments in this work. These results are in agreement with those obtained by Ali *et al.* (2001), they mentioned that, the interaction between varieties and NP rates had significant effects on borers infestation. The lowest infestation was found in sugarcane varieties treated with zero rate of nitrogen and 48 kg of potassium /fed . Meanwhile, the highest infestation was observed under zero kg of potassium and 120 kg nitrogen /fed. In this respect Salama *et al.* (2005) noticed that, using the recommended nitrogen fertilizer 200 units with 100 kg potassium sulphate (48%) /fed and PH 8013 variety were considered the proper agricultural practices decreased the population of *P. tenuivalvata* ,and resulted in the increasing of both sugarcane yield and juice at Qena governorate.

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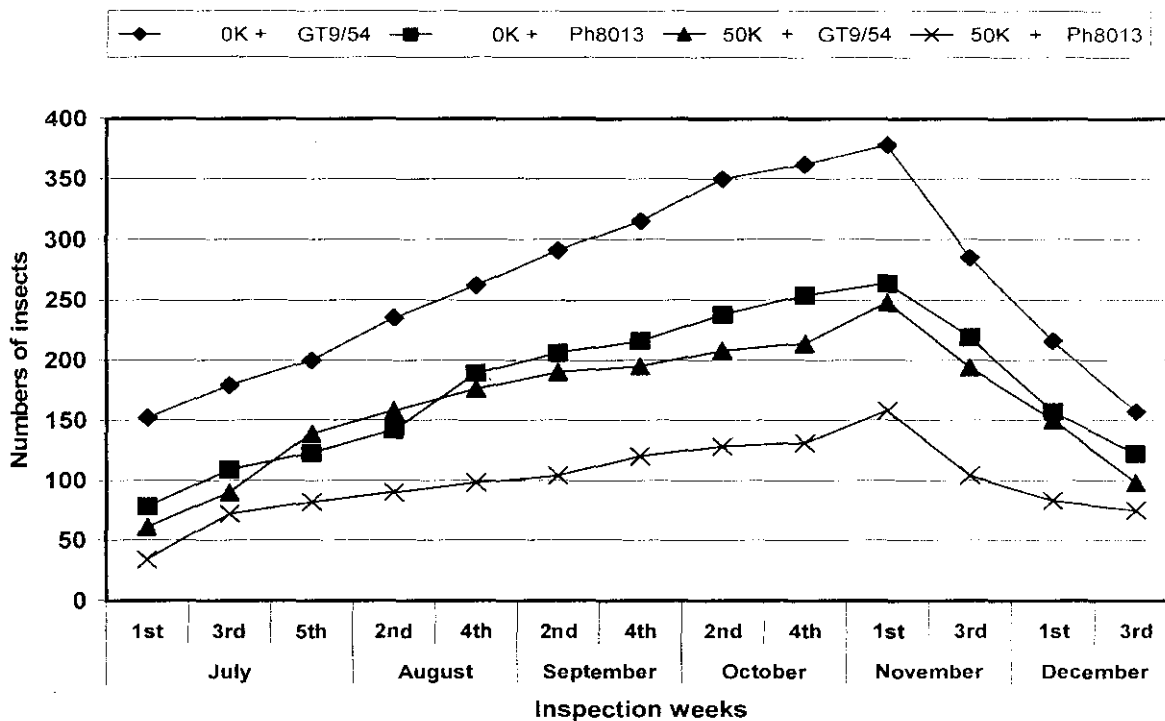


Fig.1. Effect of interaction between tow levels of potassium fertilizer and tow sugarcane Varieties on population density of *P. tenuivalvata* during 2004/05 season.

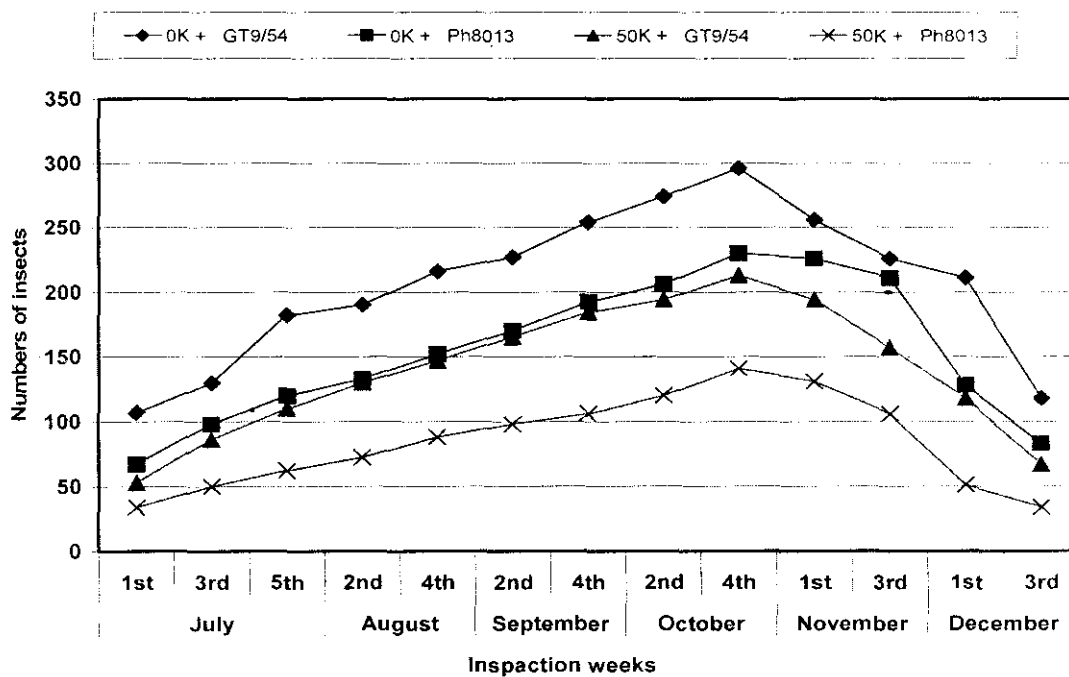


Fig. 2. Effect of interaction between tow levels of potassium fertilizer and tow ugarcane varieties on population density of *P. tenuivalvata* during 2005/06 season.

Table 1. Effect of two levels of K fertilizer on population *Chilo agamemnon* infestation and *Pulvinaria tenuivalvata* of infesting two sugarcane varieties as well as the yield during the two seasons.

Chsracters treatments		2004/05					2005/06				
		<i>C. agamemnon</i>			<i>P. tenuivalvata</i>	Yield ton/fed.	<i>C. agamemnon</i>			<i>P. tenuivalvata</i>	Yield ton/fed.
		%bored stalks	%bored joints	%breakage stalks	No. of nymphs and adults /120 leaves		%bored stalks	%bored joints	%breakage stalks	No. of nymphs and adults /120 leaves	
Varieties	GT9/54	48.88	5.63	8.38	211.65	66.54	62.25	7.25	14.00	173.27	68.73
	PH8013	57.75	8.88	17.63	138.31	65.20	75.63	9.75	24.13	119.58	67.68
	significant	*	*	*	**	NS	*	*	*	**	NS
Potassium fertilizer	0KgK2O	64.38	9.00	16.88	219.19	62.42	81.13	10.75	23.75	180.89	65.18
	50KgK2O	42.25	5.50	9.13	130.77	69.33	56.75	6.25	14.38	111.97	71.23
	significant	**	**	**	**	*	**	**	**	**	*

NS = Non significant

* = Significant at 0.05

** = Significant 0.01

Table 2. Effect of interactions between K fertilizer rates and sugarcane varieties on *C. Agamemnon* and *P. tenuivalvata* infestations as well as the yield during the two seasons

seasons	Potassium rate (kg/fed.)	<i>C. agamemnon</i>						<i>P. tenuivalvata</i>		Yield	
		bored stalks		bored joints		breakage stalks		nymphs and adults		(ton/fed.)	
		%		%		%		/120 leaves			
		GT9/54	PH 8013	GT9/54	PH 8013	GT9/54	PH 8013	GT9/54	PH 8013	GT9/54	PH 8013
2004 / 05	0.0	60.0**	68.8**	7.3*	10.8**	11.8*	22.0**	260.2**	178.2**	63.00**	61.83**
	50	37.8	46.8	4.0	7.0	5.0	13.3	163.2	98.4	70.08	68.57
2005 / 06	0.0	75.5**	86.8**	9.3*	12.3**	17.0*	30.5**	206.7**	155.1**	66.07*	64.28**
	50	49.0	64.5	5.3	7.3	11.0	17.8	139.9	84.1	71.38	71.08
Mean	0.0	67.8	77.8	8.3	11.6	14.4	26.3	233.5	166.7	64.54	63.06
	50	43.4	55.7	4.7	7.2	8.0	15.4	151.6	91.3	70.73	69.83

* = Significant

** = highly significant

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دور الأصناف والتسميد البوتاسى فى السيطرة على الإصابة بثاقبة القصب الصغرى والحشرة القشرية الرخوة فى حقول قصب السكر

محمد سيد ابراهيم شلبى ، عادل محمد الراوى ، حسام أحمد صالح ، محمد ابراهيم الخولى

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة

أجريت التجارب بمركز أدفو (محافظة أسوان) خلال موسمى ٢٠٠٤/٢٠٠٥، ٢٠٠٥/٢٠٠٦ بهدف دراسة تأثير التسميد البوتاسى على صنفى من قصب السكر وكذلك تأثير التفاعل بينهما على الإصابة بدودة القصب الصغيرة والحشرة القشرية الرخوة بالإضافة إلى تأثيرها على المحصول. أوضحت النتائج إمكانية استخدام صنف القصب GT9/54 مع اضافة ٥٠ كجم سماد بوتاسيوم للفدان مع الجرعة الثانية الموصى بها للسماد النيتروجينى لتقليل الاصابة بدودة القصب الصغيرة وزيادة المحصول الناتج (٧٠,٧٣ طن/ فدان). بينما استخدام الصنف PH8013 مع اضافة نفس كمية السماد البوتاسى للفدان وبنفس الطريقة أمكن تقليل الكثافة العددية لحشرة القصب القشرية الرخوة وزيادة المحصول الناتج (٦٩,٨٣ طن / فدان).