



**Some factors affecting the infestation of pink sugarcane mealy bug
Saccharicoccus sacchari in Luxor governorate.**

By

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SUMMARY

Collected the main factor affecting SS

From the previous results, the most important factors affecting *S. sacchari* can be concluded. In this study, the most important factors that affected SS were genetic factors that were the effect of cultivars diversities on such insect using different infestation techniques. These were the effects on response diversities, infestation dates/cultivar and plant ages.

I. Genetic (Internal factor)

1. Pant

a.1. Effect of Cultivars Diversities on SS using different infestation techniques

a) Population density of *S. sacchari*

1. Effect on response diversities of sugarcane cultivars

- In general, the tested cultivars and seasons greatly varied in their susceptibility to the different stages of *S. sacchari*.
- GT54-9 was particularly susceptible in both seasons to nymphs and all stages.
- Throughout two seasons, G3 had a significant number of females and adult females.
- G4 was extremely tolerance to all insect stages at IRC except for females and in PC for nymphs and adult females.
- G48-47, G2003-44 and G 99-103 were rated as moderately susceptible to infestation by *S. sacchari*.

2. Effect on infestation dates per cultivar

- The highest dates of infestation fluctuated from season to season, from cultivar to cultivar or from technique of infestation to other.

Summary

- During both seasons, all sugarcane cultivars started infestation with nymphs and all stages on 01-Jul, G84-47 & G99-103 for Females and G3 for AF in PC and On 15-Jun-17, all stages of SS infested both GT54-9 and G3.
- However, during August 2016, G84-47, G2003-44 and G4 were infested by AF in PC.
- In 1RC, G2003-44 and G4 were infested by all SS stages on 15-Jul-17 and GT54-9 & G99-103 for AF and G84-47 for nymphs & AS.

b) IIN, IIN%, Isn%, Isn and II infestation techniques

1. Effect on response diversities of sugarcane cultivars

- In both seasons GT54-9, G3 and G99-103 were ranked among the top three sugarcane cultivars for IIN, IIN percent, Isn percent, Isn and II infestation techniques.
- The G84-47, G2003-44 and G4 scores ranged in 5 infestation techniques during both seasons.
- The decreasing order of the previous cultivars was G84-47 > G2003-44 > G4 in 1RC for IIN, IIN % and G2003-44 > G4 > G84-47 in PC for Isn, Isn% in 1RC.
- The remainder order of G84-47, G2003-44 and G4 differed.

2. Effect on infestation dates per cultivar

- The lowest peaks were recorded at 1st inspected dates during both seasons.
- The highest infestation dates were fluctuated from season to season, from cultivar to cultivar or from infestation technique to other.
- Using II technique revealed that the highest its values were recording during Sep in both tested seasons except G3 (on 15-Aug-16) in PC.
- Applying IIN% indicated that the highest IIN% were observed from Jul to Sep in both seasons with exception G84-47(01-Oct-16).

3. Effect on age of plant

IIN, IIN%, Isn%, Isn and II in PC had low values in compared with the 1RC.

a.2.Effect of stalk portions

The main effected factors were genetic and environmental factors. The genetic factor included the achieves of genetic variations of sugarcane cultivars on beginning and interrupting dates of fluctuation each stage on each portion and the most affected portion of the stalk. In addition, the effects of genetic variations of sugarcane cultivars included the fluctuation infestation % with *S. sacchari* stages as stage/portion% and portion/ stages%.

a.2.1. Effect of genetic variations of sugarcane cultivars on:

a.2.1.1. Fluctuation of each stage on each stalk portion

a.2.1.1.1. The beginning of infestation for each portion of the stalk cultivars

The beginning of infestation for each portion of the stalk cultivars differed according to seasons, sugarcane cultivars and insect stages.

a) Nymphs

- At the upper and middle portions, nymph infestations appeared at 15 Aug 2016 for all cultivars of sugarcane except G84-47 at the upper portion and G54-9 at the middle one in.
- Nymph appearance was achieved on 01 Jul 2016 at the basal portion for all sugarcane cultivars except for GT54-9 in PC.

b) Females

- ❖ The variation among starting dates of infestation with stages of SS were recorded
- ❖ Infestation of all sugarcane cultivars with F started on upper portion on 15 Aug 2016 except for G99-103 and G3 began on 1 Aug and G84-47 on 1 Jul 2016 in PC and for G4 in 1RC.
- ❖ G99-103 & G2003-44, on 1 Aug for GT54-9, G84-47 & G3 started on 15-Jul in 1RC.

Summary

- ❖ The infestation with F of the middle portion of G54-9 started on 15 Jul on 1 Aug for G99-103, G3 & G2003-44 and on 15 Aug 2017 for G84-47 & G4 in 1RC.
- ❖ The basic portion infestation with F of G84-47 and G99-103 started on 1 Jul in both seasons, on 15 Jul for G4 in 1RC & the rest of sugarcane cultivars in PC .

c) Adult females

- For all sugarcane cultivars on upper and middle portions infestation with AF were instituted on 15 Aug in PC, excluding G99-103 (upper portion) and GT54-9 & G4 (middle one) in PC.
- The basal portions infestation with AF in PC initiated on 1 Jul for G3, on 15 Jul for GT54-9 and G99-103 and on 1 Aug 2016 for G84-47 and G4.
- In 1RC, AF's appearances began on 15-Jul-17 for all cultivars used except for G84-47 and G3 which began two weeks later.

d) All stages

- ❖ In PC, the upper portion infestation with AS established on 15 Aug for G3 and G2003-44 and on 1 Aug for G99-103.
- ❖ On 15 Jul for GT54-9, on 1 Aug for G99-103 & G3 and on 15 Aug for G2003-44 and G4 the middle portion was infested with AS.
- ❖ During the 1st ratoon cane, most of the infestation with SS started two week later than in PC.

a.2.1.1.2. The interrupting dates of infestation for each portion of the stalk cultivars

a) Nymphs

- The infestation with nymph on upper and middle portions terminated on 01-Mar 2018 with exception middle portions of GT54-9 and G3.
- Early initiation and stoppage of infestation by a basal nymph followed by the upper and middle portions at PC.

Summary

b) Females

- For stopping female infestation, the middle and basal portions among sugarcane cultivars were diverted.
- The infestation with F on the middle portion of G4 only existed at two intervals from 15 Aug to 01-Sep 2017.
- For all sugarcane cultivars, the infestation of female terminated on 1 Mar 2018 as well as the middle portion of G84-47.
- The basal portion of GT54-9 was prevented from infestation with F on 1 Aug, followed by G3 on 1 Sep, G4 on 15 Oct and G99-103 on 1 Dec 2016.

c) Adult females

- a. The upper portion ended to infest with AF on 1 Mar 2018 except on 1 Feb 2018 for G2003-44.
- b. The end of middle- and basal portions infestation with AF varied.

d) All stages

- ❖ The upper portions infestation with AS for all sugarcane cultivars continued until 1 March 2018.
- ❖ The middle portions infestation with AS had been sustained for GT54-9, G3 and G99-10, for 15 Jan, 1 Feb, and 15 Feb 2018, respectively.
- ❖ In addition, the basal stalk of GT54-9, G84-47, G99-103 and G3 infestations with AS continued until 15 Sep, 1 Oct, 15 Oct and 1 Nov 2017, respectively

a.2.1.2. The most affected portion of the stalk

- During two tested seasons, the highest portions of infestation with each SS stage were the upper followed by middle and basal ones.

a.2.1.3. Fluctuation infestation % of each stage and each stalk portion

2.1. Infestation Portions% with *S. sacchari* per each stage (Stage/Portions)

- ❖ The ranges of nymphs & all stages as well as females % in the upper, middle and basal portions of **plant cane** were 40's, 30's and 20's for all tested sugarcane cultivars, with the exception of G84-47 for nymphs & all stages and G99-103 & G4 for females.

Summary

- ❖ The nymphs % & all stages on G84-47 were 50's % in upper, 28's % in middle and 19.5% in basal portion. However, the females % of G99-103 & G4 were 50's, 20's and 10's for upper, middle and basal portions respectively.
- ❖ The AF% on upper portion was 60's for G99-103 & G4, 50's for GT54-9 & G3 and 40's for G84-47 & G2003-44.
- ❖ However, the AF% on upper portion was 30's for G84-47, G2003-44, G3 & G3 and 27's for both G99-103 & G4.
- ❖ In regard to basal portion, the AF% on basal portion was 26.87% for G2033-44, 10's for G84-47, GT54-9, G3 & G4 and less than 10 (9.88%) for G99-103.
- ❖ There are wide differences during 1RC for each cultivar of sugarcane as well as for each stage of *S. sacchari*.
- ❖ The range of the infestation percentage for each stalk portion per upper portion during 1RC was 51.23-71.3% for nymphs, 53.92-78.47% for females, 79.61-97.04% for AF and 53.82-70.56% for all stages.
- ❖ On the other hand, these ranges of percentages on middle portion during 1RC were 3.88-34.15 for nymphs, 11.11-40.69% for females, 2.22-18.45% for AF and 6.56-33.13% for all stages.
- ❖ In regard to basal portion, these percentages during 1RC were 7-22.87% for all stages.

2.2. Infestation portions % with each *S. sacchari* stages/stalk portion (Portion/Stages)

- The infestation percentage for each stage of *S. sacchari* per upper stalk portion was more than 90% for nymphs in both seasons .
- These percentages were less than 8.9% in PC and 6.5 % in 1RC for females and less than 3% in PC and 6.3% in 1RC for AF.
- The main effected stage was nymphs that need more attention to control it.

b) Insect factors:

b.1. Voltinism

The results of GT54-9 were used. The most relevant factor influencing on *S. sacchari* may be deduced from the preceding experiments.

This factor was voltinism of SS. Four methods for determination, they were compared. However, this factor points out the heavy infestation of such insect. Furthermore, the forecast voltinisms were estimated for the seasons 2048/49, 2049/50, 2073/74, 2074/75, 2098/99 and 2099/2100 to expect the infestation development in these seasons.

b.1.1. Methods of determination voltinism

Four methods were divided into:

b.1.1.1. Two population density (PD) techniques

a) Insect Numbers

- The majority of the dates examined were under 100.

b) Population changes

- The change in the population increases greatly from 15-Jun to 1-Sep (hot periods) and does not vary much from 15-Sep to 1-Mar (cold periods).

c) Factor affect on PD

- These results revealed that the population of such insect depended on the temperature changes.

A. Actual appearance peaks method (AAPM)

1) Voltinism

- According to AAPM, there were 5 generation numbers during both checked seasons.

2) Generation Intervals

- After 92 and 59 days the 2nd and 5th generations finished, respectively.
- Nevertheless, only 1st, 3rd and 4th generations were completed at ~30 days through PC.

3) The long & short Generation Intervals

- During 1RC season, the lowest duration was observed for 1st and 4th **generation** (30 days) followed by 3rd (47 days), 2nd (62 days) and the highest one was done at 5th generation (90 days).

B. Audemard and Milaire method 1975 (AMM).

1. Voltinism

- Data of AMM pointed out that **voltinisms** were 4 for PC and 5 for 1RC.

2. Generation Intervals

The duration in days increased by increasing plant ages in PC and the fourth generation was the largest length time (120 days).

3. The long & short Generation Intervals

- The lengths for 1RC in days had not increased by more than 45 days and were reported for 2nd, 3rd, and 5th generations.
- The minimum period for 1st generation was reported (30 days).

a.1.1.2. Two heat unit techniques :-

a) Richmond et al. (1983) (RM).

- The PC and 1RC **voltinisms** were 4 and 5, respectively.
- The length for hot (> 30 ° C) cycles in days per one generation was ~30 for both seasons.
- The daytime duration of one generation was 44 (23.81: 29.33 ° C) and 91 days (15.4: 24.22 ° C) (cold periods beginning).
- For both seasons measured, the low-temperature cycles below 20 degrees did not allow the generation to complete.

b) Jasic (1975) (JM) methods

- The estimation of JM process **voltinisms** were 5 and 7 generations for PC and 1RC, respectively

Summary

- For each generation (hot periods) the duration in days ranged from 15 June to 9 Sep and duration in days were between 20 to 23 days in the PC and 19-22 days in the RC.
- The average generation period in days during relatively cold periods was 29 days in PC, and in 1RC between 36 and 116 days.

c) Comparing All techniques

- RM, AMM and AAPM gained 4 and 5 generations in PC and 1RC, respectively.
- AAPM, RM & AAPM had 5 **voltinisms**.
- The highest **voltinism** was observed by using JM at 1RC (7 generations) which increased 2 generations than other tested methods.
- JM & AAPM during PC gained 5 generations which increased 1 generation than RM.
- Broad-spectrum, the **voltinisms** of SS ranged between 4 to 7.

b.1.2. Current and forecasted SS population densities in Mattana, Luxor, Egypt during the current and future seasons

b.1.2.1. Current SS population densities in Mattana, Luxor, Egypt during two successive seasons

- In 1st season, current PD was lower during 1-Jul: 1 Aug and 1-Nov: 1-March than three-tested climate sensitivities for three future dates.
- On the contrary, current PD was higher during the period from 15-Aug: 15-Oct than previous dates and climate sensitivities.
- PD at 1.5 °C climate sensitivity were higher than 3°C followed by 6 °C during 1-Jul: 1-Nov then after this date, the PD at 1.5 °C were lower than 3°C followed by 6 °C.
- During the 2nd season, current PD was higher than PD at three tested sensitivities except at 15th –Jun: 15-Aug and 15th Jan: 1-Mar during 2050.

Summary

- During 2075 and 2100, the current PD was lower than 6°C at 15-Jun and 15-Jan: 1-Mar for 3 and 1.5 °C.
- The current PD was less than 3 climate sensitivities during PC, except for the periods between Aug 15 and Oct 15.
- On the other hand, at 1.5 °C, the PD was above 3 °C.
- PD decreased by increasing climate sensitivities in the 1st season and vice versa in the 2nd season.
- The variations in PPD among climate sensitivities were observed in 2100 than in 2075 and 2050.
- Also, the variations were obviously in the 2nd season.
- The change in the PD greatly from 15-Jun to 1-Sep (hot periods) and does not vary much from 15-Sep to 1-Mar (cold periods).
- These results revealed that the population of such insect depended on the temperature change.

b.1.2.2. Predicting the SS field generations under future climate dates (2050, 2075 & 2100)

a) According to RM

PC

- For the current PC, according to RM, the **voltinisms** had not changed during 2048/49 for all tested climate sensitivities as well as 1.5 ° C for the season 2073/74.
- Only one generation had increased for the rest of the future years and climate sensitivities (5 generations).

1RC

- During 1RC, all tested future seasons; only 2099/100 season gained one generation (6 generations) more the current season (5 generations).

b) According to JM

- JM in the plant (6 **voltinism**) and 1st **ratoon canes** (7 **voltinism**) at current seasons, the **voltinisms** had not changed at all tested future seasons except seasons at 6 °C 2073/74 and 2098/99 (7 **voltinism**) in PC and 2074/75 and 2099/100 (8 **voltinism**) in 1RC.
- These variations were one generation more than current seasons in both tested seasons.
- Generally, in future predication, SS had 4-7 generations during PC, while in 1RC the **voltinisms** were 5-8 generations.
- However, during the current PC and 1RC seasons, **voltinisms** were 4-6 and 5-7 generations, respectively.

Finelly

- The highest **voltinisms** were recorded at 6 °C during 2050 and 2100 seasons for both tested seasons.
- Therefore, it is preferable to use more than one method for counting the **voltinisms** of any object.

b.2. Life Cycle

Rearing SS

Three materials were used to rear SS i.e. potato sprouts, Pumpkins and cut sugarcane internodes. In regard to potato sprouts, it was very difficult to count and distinguish of instars of *S. sacchari* because of the overlapping buds in the potato. The breeding on pumpkins failed because the development of *S. sacchari* did not occur. It can be concluded that culturing of *S. sacchari* on sugarcane is easy

The population ecology of that insect was affected by climate change. From these results, the genetic factors of insect revealed that

- The main mode of reproduction is parthenogenic, because of male absent.
- No eggs were produced but new crawlers, that is ovoviviparous.

Summary

- The three nymphal instars occupy 17-89 days and its adult life 35.15 days.
- The immature stages consisted of 3 instars with the stadia of 1st, 2nd and 3rd instars were 8.0, 8.33 and 8.0 days, respectively.
- The female laying period and new crawlers numbers /female of *S. sacchari* were 10.50 days and 76.0 new crawlers numbers /female, respectively.
- The generation period ranged between 33 to 39 days and its average was 35.83 days.

b.3. Natural enemies

- According to the proceeding findings, all tested fungi had effects on both tested stages.
- *B. bassiana* surpassed all other fungi in controlling SS on sugarcane followed by *M. anisopliae* and the least one was *Penicillium* sp.
- Moreover, these results were ascertained by the calculated LT and LC. *B. bassiana* surpassed, *M. anisopliae* and *Penicillium* sp. were new records in Egypt.
- It may also suggest both *B. bassiana* and ***M. anisopliae*** to be apply to sugarcane fields for controlling SS. The applied such fungi are safer, for reasons of practicability.

II. Abiotic Factor

i. Climate factors

A) Infestation techniques during PC & 1RC seasons

1. Effect of dates of highest extent infestation

a) Population densities of *S. sacchari*

- In PC, The highest infestations intervals of were recorded for nymphs at 15-Aug - 1st Oct, for F at 1st Sep - 1st Oct, for AF at 1-Sep - 15-Sep-16 and for all stages at 01-Sep - 01 Oct-16.

Summary

- In 1RC, A peak period of infestation was reported for nymphs at 1st Oct - 15th Dec, for F at 15-Aug - 15-Sep, for AF at 15-Aug - 1-Dec and for All stages at 1-Aug-17 -15- Jan-18.
- The lowest stage numbers was observed at the beginning inspected dates and last inspecting dates during both tested seasons.

b) IIN, IIN%, Isn%, Isn and II infestation techniques

- The highest periods for IIN were recorded at 01-Sep 2016 until 01-Nov 2016 in plant cane and at 15-Aug 2017 till 1-Feb 2018 in the 1st ratoon cane.
- The higher infestation cycles (IIN%) from the reported 1st infestation to 1st Oct were recorded in both test seasons.
- On the other hand, the highest values of Isn & Isn% in the plant and the 1st ratoon canes were registered on 1st March.

2. Correlation and multiple regression

A) Correlation coefficient values between different expressions of *S. sacchari* infestations and four meteorological parameters

The simple correlation coefficients fluctuated from season to season, cultivar to cultivar and meteorological factor to another.

a) Effectiveness of Temperature

- All cultivars had a highly significant correlation with different temperature levels and IIN% (positive), Isn or Isn% (negative).
- II had different responses, where, all cultivars had significant positive correlations during PC except for G84-47, moreover at 1RC only GT54-9, G99-103, G3 for all temperature as well as G2003-47 at low levels of temperature earned significant positive correlation.
- In addition, G4 had significant negative correlations at both tested seasons except at high temperature level in PC.

Summary

b) Effectiveness of Relative humidity

- All cultivars had significant negative correlations between high RH% levels and IIN% levels during the plant cant except G84-47 at medium and low RH% levels.
- On the contrary, there were significant positive correlations between Isn or Isn% and RH% levels, as well as between IIN and RH% levels for G84-47 and G4.
- The positive significant correlations between IIN, Isn or Isn and all levels of RH% were identified in the 1st ratoon cane except G99-103 at high and medium RH% levels.
- Additionally, for G84-47, G99-103, G3, and G4, positive significant correlations were detected between AS and low level of RH%.
- In general, significant correlations between RH% levels and IIN% or Isn were confirmed during both seasons for all cultivars.

c) Effectiveness of Dew point

- For all tested cultivars during both seasons, significant negative correlations were observed between the dew point and Isn or Isn% at all levels.
- For all the dew point levels except for the G84-47 at the high dew point level, positive correlations were observed for IIN%.
- Furthermore, the significant positive correlations for GT54-9 between AS and all dew point levels were observed.
- G3 had significant positive correlations between AS and dew point levels at medium or low levels and G4 at medium dew point.
- All cultivars had a significant positive **correlation** between II or IIN% and all levels of dew point.
- Bringing together results of two seasons, significant negative correlations between Isn, Isn% or II and dew point at low and medium levels had been identified for all tested cultivars except G84-47 at II in PC.

Summary

- This indicates that the relationship between all checked cultivars and all the dew point rates varied depending on the cultivar variations as well as the inspection seasons.

d) Effectiveness of Wind speed

- There were no significant differences between AS and high or medium winds during the PC.
- Significant correlations were observed between wind at medium or low levels and IIN % (positive), Isn, or Isn % (negative) during PC.
- During the 1st ratoon cane, only G3, G2003-44, and G4 had significant negative correlations between the high or medium level wind and Wind (km / h).
- In addition, GT54-9 gained significant positive correlations between high or medium level of wind (km / h) and IIN%.
- In the plant cane, there were significant correlations between the wind levels and different infestation strategies, not in the 1st ratoon cane.
- It is clear from the observations mentioned earlier that the best expressions to infest sugarcane by *S. sacchari* were infestation intensity% (IIN %), infested stalk (Isn) or infestation incidence % (Isn%).

B) Simple correlation coefficients per each portion and nymphs or all stages

Temperature (°C), relative humidity (%), Dew Point (°C) and wind influenced insect behaviour, including:

- The significant coefficients of correlation between meteorological parameters and all stages or nymphs for GT54-9, G99-103 and G3 were occurred on basal portion.
- G2003-44 also obtained a positive correlation on the same portion between the wind speed levels and all the stages or nymphs.

Summary

- Significant correlation between DP at average or low levels and all stages or nymphs had on the middle portion and entire stalk of G3.

a. Multiple regression per each portion

- From multiple regressions, it was notable that significant determination coefficients varied from cultivar to another, from season to season and from stage to another stage.
- For partial regression coefficients, their significant were achieved on basal portion at high temperature for G84-47, G99-103, G3 and G2003-44 and on middle portion for the previous temperature for Gt54-9.
- During the 1RC, low temperature had significant partial regression coefficients on middle portion of G4, on basal portion of G84-47 and on entire stalks of all sugarcane cultivars except G84-47.
- The significant partial regression coefficients of GT54-9 at high DP were found on entire stalk for both nymphs and all stages.

C) Infestation Dates

1. Effect of Infestation dates for stalk portion/stage

a) Nymphs

- ❖ In addition, only G84-47 and G99-103 were infested by nymph at middle portion until 1 Mar 2017.
- ❖ These middle portions of G4, G2003-44, GT54-9 and G3 continued until 1 Nov, 15 Dec 2016, 15 Jan and 1 Feb 2017, respectively.
- ❖ The infestation with basal portions of sugarcane continued for short intervals, not more than 15 October.
- ❖ The shortest infestation intervals of basal portion were continued until 15 Aug for G4 followed by 1 Sep for both G84-44 and G2003-47, 15 Sep for GT54-9 and G2003-44 and the longest one was recorded for G99-103 at 15 Oct 2.16.
- ❖ For G3, G2003-44 and G4 at 1RC, only the infestation of middle basal portions did not continue for each interval and missed some intervals.

Summary

❖ However, the infestation intervals of basal portions were short and varied.

b) Females

❖ From 15 Jul until 1 August 2016, the shortest infestation intervals with F were recorded for the basal portion of GT54-9.

❖ However, the basal portion infestation with F for both G2003-44 and G84-47 held just three intervals from 15 Jul to 15 Dec 2016 and four intervals from 1 Jul to 1 October 2016, with free intervals infested.

❖ It could be mentioned that basal portion infestation with females persisted at small intervals no more than 4 intervals.

❖ The middle portion with F persisted more intervals than the basal one.

c) Adult Females

❖ The infestation of upper portion with AF had highest interval followed by middle and basal portions in both seasons

❖ Here the same order of infestation with AF in portion was reported for females.

d) All Stages

❖ In general, basal portion infestation with AS began earlier than in the middle and upper portions.

❖ The upper portion of the infestation with AS has been higher than middle and basal portions.

❖ The basal portion of sugar canes had different intervals infestation with AS

D) Dates of the starting and interrupting of different stages of *S. sacchari* on each portion per each season

a) The starting of infestation dates during two seasons

- During PC the appearance beginning of infestations on upper and middle portions during Aug 2016 were recorded for all sugarcane cultivars and all stages with exception at Nymph for G84-47 (01-Jul) on upper, Females for G84-47 (01-Jul) on middle, AF for G4 on middle (15-Nov) & all stages for GT54-9 on middle (15-Jul).

Summary

- These beginning dates were during Jul 2016 except at AF for G84-47 on all portions (15-Aug) and G2003-44 & G4 on basal & All portions (01-Aug).
- The beginning of infestations on upper and middle portions during Aug 2017 in 1RC were watched for all sugarcane cultivars and all stages except at Nymphs for G99-103 on Middle (15-Jul), Females for G 99-103 & G2003-44 on upper (15-Jul) & All stages for G99-103 on upper & middle (15-Jul) and G4 on upper (15-Jul).

b) Interrupting dates of infestation dates during two seasons

- The interrupting dates of nymphs were recorded on upper and all portions at 01-Mar for all sugarcane cultivars in both tested season except in PC at AF for G99-103 (15-Feb on both portions) and for G2003-44 at 15-Feb on upper & 15-Dec on all portions) as well as in 1RC.
- On contrary, on both middle and basal portions, interrupting dates fluctuated., where the range interrupting dates were high.
- That range on middle and basal portions were Nov-Mar and Sep-Mar in PC and Aug-Dec and Jul-Mar in 1RC, respectively.
- These dates were early for adult females followed females and nymphs.

E) The range dates of infestation portion/stage/season (portion/ stage /season)

a) The starting of infestation dates during two seasons

- The 1st beginning infestation with females of SS on upper portion were at 01-Aug and on middle portion was at 15-Jul for nymphs and 01-Aug for AF.
- At 15-Aug in 1RC, the 1st beginning infestations with SS were on upper portion for all stages, on middle one for all stages except AF (15-Nov) and for AF on both basal and all portions.
- In addition, on both previous portions, the 1st beginning infestation with nymphs, females and all stages, of SS were during July 2017.

Summary

- The last beginning infestations with SS were at 15-Aug for all stages on upper and middle portions except AF on middle one and for AF on basal and all portions in both seasons.
 - The last beginning infestation with nymphs, females and all stages, of SS were during July 2017.
- b) **The Interrupting dates infestation dates during two seasons**
- The 1st interrupting dates of different stages of *S. sacchari* in PC at three portions of sugarcane stalks were at 15-Feb for Females & AF on upper portion and at 01-Mar for Nymphs and all stages.
 - On middle portion, these interrupting dates were 01-Nov for Nymphs and Adult females and 15-Dec for Females and All stages.
 - On basal portion both Nymphs & all stages, the 1st interrupting dates of different stages of *S. sacchari* was during Sep and at 01-Aug for females and adult females. However, on all portions, the 1st interrupting dates of different stages of *S. sacchari* all stages were at 01-Mar except AF (15-Dec).
 - The last interrupting dates of different stages of *S. sacchari* on the upper, middle and all portions were at 01-Mar in PC.
 - However, on the basal portion the last interrupting dates of different stages of *S. sacchari* ranged between Nov and Dec 2016, that was earlier than other portions.
 - On the other hand, the date of 01-Mar was observed for each portion and all portion in 1RC except females (15-Nov) on middle portion and AF (15-Aug) in 1RC.

F) Pollution factors

Interestingly using LC₅₀, treatments of Bel green were placed the first rank in reducing the infestation with *S. sacchari* with significant variations followed by Actara, Malasom, Applaud and the least effective one was Evisect after 24, 48 and 72hr.

Moreover, the percentage mortality of Actara and Bel green WG superior to the other tested insecticides. The least one was Evisect.

b.4. The effectiveness on responses of sugarcane traits to infestation with *S. sacchari*

The effects on sugarcane traits were discussed as follow:

GT54-9 had the highest effect on losses of stalk height, cane & sugar yields, sugar/nymph, sugar/all stages and all juice quality except purity%. G84-47 owned the great impact of losses on cane yield/nymph and per all stage and lowest effect on sucrose% and Pol%.

G99-103 possessed strong effects on stalk height, cane yield, sugar yield, cane yield /nymph or all stages, sucrose recovery %& Pol% and less one on sugar yield / nymph or all stages and sugar reduction.

G3 had a strong influence on sugar yield, sugar yields/ nymph or all stages and all juice qualities except reducing sugar% and less effect on cane yield and cane yield /nymph or all stages.

G2003-44 had a strong effect on sucrose%, purity% and reducing sugar% and less influence on other components of yield.

G4 had no high impact on all sugarcane traits but had the lowest effect on sugar yield and all juice qualities with exception reducing sugar%.

Sugarcane reaction traits to infestation with SS differed. Yet accompanied by G84-47 and G99-103, the GT54-9 showed the strongest impact on their characteristics. These findings may be due to high infestation with all stages except G84-47. The lowest impact on sugarcane characters were observed for G4, G2003-44, and G3 that had low infestation with all stages numbers except G3.

In regard to infestation data with all stages of SS, GT54-9, G3 and G99-103 gained high infestation (susceptible ones) and G2003-44, G84-47 & G4 had least ones (tolerant ones).

For both G84-47 and G3, unexpected outcomes were reported. While G84-47 had less infestations and higher attribute effects, and vice versa for G3. Therefore, it may be that G3 was more tolerant of SS and G84-47 was less tolerant of SS.

In general, the role of sugarcane cultivar is considered the corner stone or the main factor in governing the expected sugar yield. It is well known that sugarcane cultivars are widely different in their potentiality with regard to cane and sugar yields.

b.5. Factors influencing *S. sacchari*- physical characteristics of sugarcane cultivars interactions

GT54-9 and G3 gained high infestation and affecting sugarcane traits, these effects may be return to absent wax and wax beam on internode and vice versa for G4 and G2003-44, which had wax, and wax beam.

G84-47 owned moderate infestation and less affecting sugarcane traits. The internode of this cultivar had wax and no wax beam.

G99-103 possessed moderate infestation and high affecting sugarcane traits. The internode of this cultivar had wax and wax beam was absent.

Although, the wax was observed on internode of both G84-47 and G99-103, the affecting sugarcane traits were varied. In the future, further study is expected on these phenomena to explain it.