SUMMARRY

Results obtained throughout this investigation could be summarized in the following:

1- Isolation trials from un-sterilized kernels of two yellow corn hybrids (SC-3062 and DC-Dahab) and one female inbred line (FIL-X) yielded the 217 fungal isolate belong to 5 genera and 15 species. Isolated fungi were purified and identified as *Aspergillus flavus* (36 isolate), *A. niger* (18 isolate), *A. versicolor* (17 isolate) and one isolate of *A. terrus* and *A. ochraceus*. On the other hand, 27 fungal isolates were found to be belong to *Fusarium moniliforme*, 14 isolate for each of *F. tabacinum* and *F. solani*, 13 isolate for *F. semitectum*, 9 isolate for *F. tricinectum* and 8 isolate for *F. nivale*. Only one isolate belongs to *Penicillium funculosum*. Meanwhile, 23 isolate were found to be belong to each of *Alternaria* spp. and *Rhizopus* spp. and 12 isolate were unknown fungi.

2- Hybrid SC-3062 showed the highest frequency (112 isolate) followed by DC-Dahab (56 isolate) and FIL-X (49 isolate). *A. flavus*, *F. moniliforme*, *F. semitectum*, *F. tabacinum*, *F. nivale*, *Alternaria* spp. and *Rhizopus* spp showed the highest frequency percentages on SC-3062 grains. While, *A. flavus*, *F. solani*, *F. moniliforme*, and *Alternaria* spp. and *Rhizopus* spp showed the highest frequency percentages on female inbred grains FIL-X. As well as, *A. niger*, *A. flavus*, *A. versicolor*, *F. moniliforme* and *Rhizopus* spp showed the highest frequency percentage on DC-Dahab grains.

3- On the other side, 187 fungal isolates were isolated from sterilized kernels of two yellow corn hybrids (SC-3062 and DC-Dahab) and one female inbred line (FIL-X). These isolates were purified and identified as *A. flavus* (28 isolate), *A.niger* (26 isolate), *A. versicolor* (11 isolate), *A. terrus* (9 isolate) and 5 isolates of *A. ochraceus*. Meanwhile, 22 isolate were found to be belong to *F. solani*, 16 isolate to *F. moniliforme*, 15 isolate to *F. semitectum*, 10 isolate for *F. tricinectum*, 8 isolate

for *F. tabacinum* and 7 isolate for *F. nivale*. While, 6 and 5 isolate for *P. funculosum* and *P. digitatum* respectively. Meanwhile, 16 isolate were found to be belong to *Alternaria* spp. and 2 isolate to *Rhizopus* spp., while only one isolate was unknown.

4- Hybrid SC-3062 showed the highest frequency (81 isolate) followed by female inbred line FIL-X (65 isolate) and DC-Dahab (41 isolate). *A. niger*, *A. flavus*, *F. tricinectum*, *F. solani*, *F. moniliforme*, *F. tabacinum*, *A. versicolor*, and *Alternaria* spp. showed the highest frequency percentages on hybrid SC-3062. Meanwhile, *F. solani*, *F. semitectum*, *F. moniliforme* and *A. flavus*, showed the highest frequency percentages on female inbred line FIL-X. While, *A. flavus*, *A. niger*, and *Alternaria* spp. showed the highest frequency percentages on hybrid DC-Dahab.

5- Under lab. conditions, five species of genus *Fusarium* (*F. moniliforme, F. semitectum, F. solani, F. tabacinum and F. nivale*) were tested for their pathogenicity on corn grains at different levels of moisture contents (13, 15, 17, 20 and 23%) and at three incubation periods (15, 30 and 45 after the infestation). Results showed that all *Fusarium* species can not be able to infect grains of yellow corn hybrid SC-3062 at 13 and 15% moisture contents. While, infection appeared at levels 17, 20 and 23%. It is pronounced from the obtained results that infection % were gradually increased proportionally to moisture content of grains and incubation periods. The infections were high at 20 and 23% moisture content of grains and reached 100% for all tested *Fusarium* spp. 45 days after infestation.

6-Results showed that all tested *Fusarium* species in this study did not able to infect yellow corn hybrid (DC-Dahab) under 13, 15 and 17% of moisture contents. While, 20 and 23% of moisture contents were favorable for infection by *Fusarium* species. The obtained results cleared that *F. moniliforme* caused 22 %

infection at 45 days post inoculation followed by *F. semitectum* and *F. solani*. The results, also, cleared that grains of hybrid SC-3062 were more sensitive than grains of hybrid of DC-Dahab for infection by tested *Fusarium* species and infection percentages were affected also by incubation periods, moisture content % and type of *Fusarium* species.

7- Regarding the chemical determination, results showed that the highest total protein % was determined in infested grains of DC-Dahab with *F. moniliforme* and *F. semitectum* (9.5%) followed by *F. tabacinum* at 23% moisture content while, the least total protein % was recorded in infested grains with *F. moniliforme* at 13% moisture content. It is pronounced from results of DC-Dahab that increasing moisture content levels increased gradually total protein percent in all infested yellow corn grains and control. Concerning hybrid SC-3062, the highest total protein % was determined in infested grains of SC-3062 with *F. solani* and *F. tabacinum* at 23% moisture content while, the least total protein % was recorded in infested grains with *F. nivale* at 15% moisture content..

8- Total carbohydrates in infested yellow corn grains of hybrid DC-Dahab were ranged between 66.0-72.6%. The minimum total carbohydrate % was recorded in infested grains with *F. nivale* at 23% moisture content while the maximum percent was determined in infested grains with *F. semitectum* at 17% moisture content. On the other hand, slight differences in the determined total carbohydrates in all infested grains of hybrid DC-Dahab infested with *Fusarium* spp. at the different moisture contents and control. Concerning hybrid SC-3062, total carbohydrates were ranged between 68-74%. The minimum total carbohydrate % was recorded in infested grains with *F. tabacinum* and *F. moniliforme* (68%) at 13 and 15% moisture content respectively. While. The maximum was case of infested grains with *F. solani* (74%) at 23% moisture content. Meanwhile, there was a positive

correlation between the determined total carbohydrates and grain moisture contents of hybrid SC-3062 that infested with *Fusarium* spp compared to control treatment. In this respect, the determined total carbohydrates were increased remarkably in all infested grains of hybrid SC-3062 at moisture contents of 20 and 23% compared with control

9- Fatty oils in infested yellow corn grains of hybrid DC-Dahab with *Fusarium* spp. ranged between 4.2-5.8% and between 3.3-4.1 of hybrid SC-3062. The least fatty oils % was determined at 13% moisture content in infested grains of hybrid DC-Dahab with *F. moniliforme*, *F. solani* and *F. tabacinum* (4.2%), meanwhile it was (3.3%) at 23% moisture content in infested grains of hybrid SC-3062 with *F. semitectum* and *F. solani*. On the other hand, the highest fatty oil percent were determined at 23% moisture content in grains of hybrid DC-Dahab infested with *F. solani*, *F. tabacinum* and *F. moniliforme*. While, it was 4.1% at low moisture content (13-17) of grains of SC-3062, which infested with *F. semitectum*, *F. nivale and F. moniliforme*. The results cleared also, that fatty oil percent increased at the high moisture content (20& 23%) in infested grains of hybrid DC-Dahab while, the reverse was true, where fatty oils were decreased in infested yellow corn grains of hybrid SC-3062 at moisture content levels 20 & 23% compared to control.

10- Concerning mycotoxin production, results revealed that fumonisins mycotoxin began to appear in infested yellow corn grains of hybrid SC-3062 at 17% moisture content level and reached the maximum production at 23%. Meanwhile, no production was recorded at low moisture levels (13 & 15%). Therefore, the highest amount of fumonisins was recorded in infested yellow corn grains (17.1µg/g) with *F. moniliforme* at 23% moisture content. Also, all *Fusarium* species were able to produce these mycotoxins but differed in their produced amounts at 23% moisture, except *F.*

tabacinum. The results indicated also that *F. moniliforme* followed by *F. nivale* are consider the highest producer isolates of fumonisins than the other tested isolates.

11- Protein bands extracted from electrophoretic gel of soluble proteins extracted from seedlings of hybrids DC-Dahab and SC-3062 and female inbred line FIL-X showed that the 3 tested yellow corn entries had separated clusters.

- The first lane represent the cluster of hybrid DC-Dahab, the second represent hybrid SC-3062, while the third represent female inbred line FIL-X. The fractionated protein bands of the three corn entries were verified, which were of three different clusters but there were clear similarities between them also. The similarity between grains of hybrid SC-3062 and its female inbred FIL-X reached 83.33% while, the similarity between grains of hybrid DC-Dahab and both other grains reached 74.35%.

12- The high levels (4 and 5%) of Fusarium inoculum decreased effectively germination percentages, height, fresh and dry weight of germinated seedlings of infested grains of hybrid (SC-3062). Also, significant differences between tested *Fusarium* species at the different inoculum densities were noticed.

- Results showed also that *F. solani* and *F. moniliforme* were the most effective isolates on decreasing germination % when used at inoculum level 5%, where they reduced germination percentage to 73 and 80%, respectively. Meanwhile, slight differences in germination % were recorded as a result of infestation with *F. moniliforme, F. semitectum* and *F. nivale* were noticed when used at inoculum levels 3 and 4%.

13- Regarding the plant characters, slight or no effect of *Fusarium* spp on shoot and root lengths was recorded at inoculum levels 2 and 3%. Meanwhile, *F. moniliforme and F. semitectum* were the highest effective isolates on decreasing root and shoot lengths at 4 and 5%. *F.*

moniliforme decreased shoot lengths to 31 and 34 cm. at 4 and 5% inoculum level compared with other *Fusarium* spp., respectively. On the other hand, *F. semitectum* was more effective on decreasing root length as well as fresh and dry weight at inoculum levels 4 and 5%.

14- Regarding ears infestation results indicated that all inoculation techniques used in this experiment succeeded in damaging the inoculated ears of hybrid SC-3062 with different *Fusarium* species. Wound inoculation was the most effective techniques followed by kernel stab and ear tip techniques in causing the highest infection percent with *Fusarium* species, where the infection % reached 72, 70 and 61%, respectively. Meanwhile, silk spray technique was the least effective one in this respect. On the other hand, *F. moniliforme* was the highest of *Fusarium* species in causing ear rot infection. Therefore, the other tested *Fusarium* species revealed a considerable ability for ear rot infection but differed in their severity.

15- As regard for germination %, all inoculation techniques, (husk, wound, silk spray, kernel stab and ear tip techniques) revealed slight effect on germination percent. In this respect, the least germination percentage were 75 and 83 % in case of wound and ear tip inoculation techniques by *F. moniliforme*, respectively, followed by wounded inoculated ears with *F. nivale*. In most cases of inoculation techniques by different *Fusarium* species, germination percentage were more than 90%.

16- Concerning the location of *F. moniliforme* in grain parts of yellow corn kernels of hybrids SC-3062 and DC-Dahab and female inbred FIL-X, results cleared that *F. moniliforme* invaded the most different grain parts. The occurrence percentage of the fungus was high in the endosperm of female inbred FIL-X (88%) followed by 41% in the pericarp of hybrid SC-3062. Also the embryo infection with *F.*

moniliforme was high in FIL-X compared with SC-3062, meanwhile, the embryo of hybrid DC-Dahab was free from the fungus. The least infection percentages of *F. moniliforme* was recorded in all different parts of hybrid DC-Dahab.

17- Regarding control trials, results showed that all chemical treatments reduced infection % on grains of hybrids DC-Dahab and SC-3062 and female inbred FIL-X compared with control treatment. As well as, all used treatments had no effect on germination %, except Vitavax 200 (in water) which reduced germination percent of hybrids DC-Dahab and SC-3062 grains compared to control treatments. On the other hand, Vitavax 200 and Captan (in water) as well as Vitavax 200 and Captan (in acetone) decreased infection incidence to high extent on grains of hybrid SC-3062 and female inbred FIL-X and to 0% on grains of hybrid DC-Dahab. Sodium hypochlorite solution at 1% and hot water treatments were lesser than fungicide treatments in their effects on germination and infection percent.

- Dipping grains of yellow corn hybrid DC-Dahab in different hot water of different degree of temperature (45-70°C/5min.) had no effect on germination % compared to control treatment. Meanwhile, hot water was of great effect on infection % where, infection % at 45 and 50°C were 10%. In the same time, infection percentage were 1 and 1.5% at 70 and 60°C, respectively. Also, positive correlation between the high water temperature and disease control was noticed. The same trend was recorded on hybrid SC-3062 concerning germination % and infection % where, hot water at 55-70°C decreased infection % on grains of hybrid SC-3062. Concerning female inbred FIL-X, all hot water treatments had no clear effect on germination % or infection % compared to un-treated ones.

18-Treating corn grains with fungicides before storage at room temperature and 8°C caused an increase in germination % and

decreased infection percentage with kernel rot pathogens. The best effective fungicide was Benlate when used at rate 1g/kg grains on grains of hybrids SC-3062 and DC-Dahab, where germination % reached 100% and infection % stilled 0% at zero time. The same trend was similar also on grains of hybrids SC-3062 and DC-Dahab at 60 days storage period followed by Vitavax on hybrid DC-Dahah only. The efficient continued on infection percentage, which stille 0 % at 60 and 90 days storage periods for both fungicides.

- While, using fungicides as grain dressing at rate 2 and 3 g/kg grains resulted in similar trend to the previously recorded results on hybrids DC-Dahab and SC-3062 with some slight differences in germination %.

- In all cases, using different fungicides reduced infection percent compared to control as well as using fungicides led to reducing infection on female inbred FIL-X with increasing storage periods. Dithane-M45, Captan and Redomil-mancozeb were the least effective fungicides compared with Benlate and Vitavax.

- Storaging grains at 8°C was more prefavorable than storaging at room temperature.