5- SUMMARY

Biochemical Studies on Some Antinutritional Factors of the seeds of New Varieties of Some Egyptian Crops

Results of the present thesis will be presented in four parts:
(i) Chemical composition of the two kidney bean varieties (Poulista and Giza 6).
(ii) Levels of some antinutritional factors (ANFs).
(iii) Effect of infestation with *C. maculatus* on the chemical components and correlation between the secondary metabolites levels and susceptibility index of kidney bean varieties.
(iv) Effect of extracted protein fractions (protein isolates; albumins; globulins and trypsin inhibitors) on the growth of four different bacterial species.

(i-A)-Chemical approximate analysis:-

The physical properties of the seeds of studied kidney bean varieties were measured. Weights of 100-seed and 100-seed-coats were
33.94 and 4.24 for Giza 6 while lower values were 17.30 and 2.16 for Poulista. Colors of seed-coats for Giza 6 and Poulista were creamy and light orange, respectively.
The total dry yields (Ton/fed.) from bean were 1.250 and 1.050 for Giza 6 and Poulista respectively as well as the yield of green pods from 3 collections 8, 7 tons of green pods for Poulista and Giza 6 respectively.

(i-B)-Chemical composition of kidney bean:-

Poulista variety contains higher crude protein level (34.46%) than those reported for seeds of Giza 6 (31.34%). Dry matter contents in both varieties are similar. The crude lipid in seeds of Poulista is 110% of its value in Giza 6. These data indicate that studied varieties are rich and inexpensive sources of crude protein (34.46%-and 31.34%) and carbohydrate (33.60 and 31.50%). And mineral composition of the two varieties kidney bean Giza 6 and Poulista the most abundant mineral in the seed flour sample was potassium (2.1 and 1.6%), Phosphorus (0.5 and 0.46%) and Calcium (0.4 and 0.6%) while the least concentrated was Zinc (26.0 and 22.0 ppm) and Iron was the same in two variety (40.0 ppm) Poulista and Giza 6 respectively.

(ii)-Levels of Antinutritional factors

(ii-A)-Total trypsin inhibitors (TTI):-

Total trypsin inhibitors (TTI) was assayed in the defatted meal of seeds of two varieties and the results indicate that the levels of TTI were 36.15 and 38.2 in extracts of Poulista and Giza 6, respectively. The lowest level of TTI (36.15 mg/g defatted meal) was recorded in the seeds of colored seed coat Poulista. Our results also showed that the white-coat seeds contain higher levels of TTI than those have colored-coat seeds.

ii-B α-Amylase inhibitory activity

α -AIs were extracted from the seeds of variety samples and the inhibitory activity was examined against Porcine pancreatic **α** –amylase (PPA). The lowest levels of **α** -AIA were found in kidney bean Poulista varieties (150-111 unit/g) but the highest ones were in extracts of Giza 6.
Our results also indicate that Giza 6 seeds contain higher levels of **α** –AIA than those determined in Creamy-coat seeds (Poulista).

(ii-C)- Phytic acid

The results indicate that lowest level of phytic acid was recorded in seeds of Poulista to be 3.2 mg/g and the highest one 4.01 mg/g found in the seeds of Giza 6.

(ii-D)- Total phenolic compounds TPCs:

The results indicated that the levels of TPCs in the two legume samples varied from 0.4 to 1.57 mg/g of the whole seeds of Giza 6 and Poulista, respectively. The concentrations of TPCs in three fractions, whole seeds (WS), testa, and cotyledons were assayed and the results showed that TPCs in Poulista always higher than Giza 6. Our results also indicate that TPCs in cotyledons in both varieties lower than those determined in testa. White seed-coat varieties (Poulista) contain higher levels than those determined in colored seed coat.

(ii-E)- Total flavonoid content (TFs):

Total flavonoids content was assayed in three fractions, whole seeds, (WS), cotyledons and testa the results showed that the two studied varieties (Giza 6 and Poulista) have different levels. The highest levels of flavonoids were determined in extracts of Poulista but the lowest one was in Giza 6. Our results also, indicate that flavonoid contents in testa (seedcoats) are higher than those that determined in cotyledons and the fractions could be ordered as follows, WS > testa > cotyledons.

(iii-A)- Effect of infestation with *C. maculatus*, F. on the chemical components of tested kidney bean.

The given data showed that six chemical components of kidney bean seeds are affected by infestation by *C. maculatus*. Some constituents such as moisture, total ash, crude fibers increased markedly. Whitest, the percentages of total crude lipids, crude protein, and carbohydrates (%) decreased in all tested varieties due to the infestation by *C. maculatus*. As compared to the infested seeds in the different varieties, the increase in moisture, total ash content and crude fibers ranged from (22.26-26.5%), (33.17-59.71%) and (55.91-70.55%), respectively. On the other hand, considerable reductions in total crude lipids, crude protein and carbohydrate contents ranged from (15-20%), (20-25%) and (15-20%) in the two tested varieties, respectively.

(iii-B)- Correlation between the secondary metabolites levels and susceptibility index of kidney bean varieties

The correlation between the five secondary metabolites (SM) including total trypsin inhibitors (TTI), a-amylase inhibitors (**α**-AIs), total phenolic compounds (TPCs), total flavonoids (TFs), phytic acid

(PA) total soluble sugars (TSS) and the susceptibility index (SI) of kidney bean varieties to infestation by *C. maculatus* was determined.
It was found that seeds of Poulista variety had the highest values of TPCs (1.57 mg/g), TFs (10 mg/g) contents as compared to tested another variety. But had the least value of susceptibility index (SI). The results of determination of some secondary metabolite levels in the extracts of both studied varieties showed that Poulista contain TPCs and TFs 4-folds higher than those found in Giza 6. These findings are very important indications for plant breeders who looking for insects and pathogens resistant genotypes. Our results also, showed that Poulista higher resistant than Giza 6 and it could be recommended for kidney bean producers.

(iv)-Antimicrobial peptides (AMPs):

- Effect of protein isolate from kidney bean seeds on the growth of different bacterial species:-

The sensitivity of microbes can be ordered as follows (**Protein Isolate)**:
Pseudomonas aeroginose> Escherichia coli > Bacillus subtillus > Staphylococcus aureus.

- Effect of protein fractions (albumins& globulin) extracted from kidney bean varieties (Giza 6& Poulista) on the growth of four different bacterial species:-

The sensitivity of microbes can be ordered as follows (**albumins& globulin)**:
Pseudomonas aeroginose> Escherichia coli > Bacillus subtillus > Staphylococcus aureus.

Antimicrobial activities of legume trypsin inhibitors:

Trypsin inhibitors were extracted from the two studied varieties and their effect on growth of four different bacteria species namely *Bacillus subtillus; Staphylococcus aureus; Escherichia coli and Pseudomonas aeroginose* were assayed. The growth of Escherichia coli was strongly affect by increasing concentrations of TIs applied on the disc where 100 µg/disc led to inhibition of 96% of the total growth.
The same trend was observed in the case of poulista extracts but the sensitivity of microbes can be ordered as follows:
Bacillus subtillus > Escherichia coli > Pseudomonas aeroginose > Staphylococcus aureus.