SUMMARY

This work included two main experiments. The first one was greenhouse experiment to study germination and germination characteristics and the second one was a field experiment to study plant growth as well as soil stability under two plant species (*Acacia saligna* and *Leucaena leucocephala*) and two chemical stabilizers (bitumen emulsion and polyvinyl acetate) during the period that extended from 2004 to 2006.

I. Pot experiment :

This experiment was carried out in the greenhouse of Sand Dune Department, Desert Research Center at Matarya, Cairo, Egypt during 2004 season to study the effect of chemical stabilizer treatments of bitumen and polyvinyl acetate on germination and germination characteristics of the two plant species i.e. *Acacia* and *Leucaena.*

A. Chemical stabilizer treatments :

These were bitumen emulsion with its concentrations (1.0%, 1.5% and 2.0%) as well as polyvinyl acetate at the rates (0.5%, 1.0% and 1.5%) and control treatment (tap water only).

B. Plant species : These were

1. *Acacia saligna*. Fam. Leguminaceae.

2. *Leucaena leucocephala*. Fam. Leguminaceae.

Soil samples were collected from sand dune of Belbes Desert, Sharkya Governorate. Every pot of size (37 x 31 cm^2)was filled with 14 kg of sandy soil and planted with 3 seeds/hill where 20 hills/pot were cultivated. Before planting, seeds of Acacia were treated by concentrated

sulphoric acid (95%) for one minute and washed five times with tap water.

Every pot was sprayed by 170 ml of each soil stabilizer after planting directly.

The main results could be summarized as follows :

1. Statistically significant differences were found in germination percentage by the application of the two studied chemical stabilizers where using bitumen emulsion with the rate of 2.0 scored the highest values of germination percentage after one, two and three weeks from planting and increments were 98.02%, 6.49% and 7.17%, respectively as compared with the control treatment .
2. Germination percentage increased significantly by planting *Leucaena leucocephala* as compared with *Acacia saligna*. These increments reached 59.78%, 36.25% and 20.55% from 1, 2 and 3 weeks after planting.
3. Significant differences were apparent on germination percentages by the interaction between plant species and chemical stabilizer treatments where spraying the soil planted with *Leucaena* with 2.0% bitumen emulsion gave the highest germination percentage after one week from application, whereas adding 1.0% polyvinyle acetate to soil cultivated with *Leucaena leucocephala* gave the highest rates after two and three weeks from planting
4. Germination capacity changed significantly with chemical stabilizers application. Applying 2.0% bitumen emulsion gave the highest germination capacity.

5. There was significant response in germination capacity with planting *Leucaena leucocephala* and these increments reached 32.67%.
6. Significant results were obtained in germination capacity as influenced by plant species x chemical stabilizer treatments. Soil treated with 1% polyvinyl acetate and planted by *leucaena* had the highest germination capacity.
7. Applying 2.0% bitumen emulsion gave the highest germination speed. On the contrary, applying 1.5 % polyvinyl acetate gave the lowest value.
8. germination Speed of *Leucaena* increased significantly in comparison with *Acacia*. The increment was 24.32% and reached the 5% level of significance.
9. There was significant effect in seedling length as affected by chemical stabilizers application. Applying 2.0% bitumen emulsion scored the highest result.
10. No Significant difference between *Acacia* and *Leucaena* in seedling length were observed .
11. Seedling length was affected significantly by the interaction between plant species and chemical stabilizer treatments applying 1.5% bitumen emulsion to *Leucaena leucocephala* gave the highest value.
12. Plumule dry weight was influenced significantly by applying chemical stabilizers where spraying 1.5% bitumen emulsion had the highest significant increase in plumule dry weight.

13 Plumule dry weight increased significantly at 5% level of significance for *Leucana leucocephala* cultivation than with *Acacia saligna*.

14. Highest plumule dry weight was obtained by using 1.5% bitumen application to soil grown with *Leucaena*.

15. Radical dry weight increased significantly by adding 1.5% bitumen emulsion.

16. Significant differences were obtained between the two studied species in radical dry weight where *Leucaena* surpassed *Acacia* in radical dry weight.

17. Chemical stabilizer treatments x plant species interaction had significant effect on radical dry weight, whereas spraying 1.5% bitumen with planting *Leucaena* gave the highest value.

18. Statistically significant differences were apparent as a result of chemical stabilizers application. Spraying 1.5% bitumen gave the best seedling dry weight.

19. Seedling dry weight of *Leucaena leucocephala* out-weighed those of *Acacia saligna* by 84.30% and these increments reached the 5% level of significance.

20. There was a significant response in seedling dry weight as affected by the interaction between plant species under study and chemical stabilizer treatments. Application of 1.5% bitumen emulsion with planting *Leucaena* gave the highest seedling dry weight.

II. Field experiment :

This experiment was carried out in the experimental farm of Desert Research Center at El-Sheikh Zuid, North Sinai Governorate during the period extended from 2005 to 2006 to study the effect of two plant species and nine treatments of two chemical stabilizers on plant growth and soil stability. Treatments were as follow :

1. Chemical stabilizers :

Bitumen emulsion with four concentrations of 1.0%, 1.5%, 2.0% and 2.5% as well as polyvinyl acetate with four concentrations of 0.5%, 1.0%, 1.5% and 2.0% and tap water as control were sprayed directly after planting.

2. Plant species :

1. *Acacia saligna*. Fam. Leguminaceae.
2. *Leucaena leucocephala*. Fam. Leguminaceae.

A randomized complete block design was used with five replicates. Seeds of the two plant species were planted on 14th 2005. The plot area was 63 m² (9 ridges of 7 m length and 1 m apart.).

Data recorded after 3, 6 and 9 months on plant height, number of leaves/plant, stem diameter and plant dry weight.

The obtained results could be summarized as follows,

1. Applying chemical stabilizers caused significant differences on plant height where spraying 2.0% bitumen emulsion gave the tallest plants after 3 months from planting while adding 2.5% bitumen emulsion and 2.0% polyvinyl acetate gave the tallest plants after 6 and 9 months from planting, respectively.
2. Significant results appeared in plant height as affected by the two plant species where *Leucaena*

leucocephala surpassed *Acacia saligna* in plant height at any growing stage. The increases reached 15.21%, 14.48% and 2.86% after 3, 6 and 9 months from planting, respectively.

3. Plant height differed significantly as affected by the interaction between plant height and chemical stabilizer treatments after 3, 6 and 9 months from planting.
4. Spraying bitumen emulsion at the rate of 2.0% on soil growing by *Leucaena leucocephala* gave the tallest plants after 3 months from planting, while adding 2.0 % bitumen and 2.0% polyvenyl acetate scored the highest values with planting *Leucaena* at 9 months after planting .
5. Number of leaves/plant was affected significantly by chemical stabilizers application. Adding 2.0% polyvinyl acetate scored the highest number of leaves/plant after 3, 6 and 9 months from planting.
6. *Leucaena leucocephala* gave the largest number of leaves/ plant under the 5% level of significance, than *Acacia*.
7. Number of leaves/plant increased significantly by planting *Leucaena* grown in soil treated by 1.0% polyvinyl acetate after 3 months, while applying 2% polyvinyl acetate to soil planted with *Leucaena* significantly increased leaves number/plant after 6 and 9 months from planting .
8. Spraying 2.5% bitumen gave the highest value of stem diameter after 3 and 6 months while after 9 months from cultivation applying 1.5% polyvinyl acetate scored the highest value of stem diameter.

9. A significant increase was obtained in stem diameter after 3, 6 and 9 months by planting *Acacia saligna*. These increases were 19,15%, 50.98% and 114.69% respectively.
10. Stem diameter was affected significantly by the interaction between plant species and chemical stabilizers application at 3, 6 and 9 months after plating.
11. Applying 2.5% bitumen emulsion to *Acacia* gave the highest stem diameter after 3 months and 6 months from planting. But applying 2.0% polyvinyl acetate to *Acacia* caused the highest increase in stem diameter after 9 months from planting.
12. Spraying 2.5% bitumen emulsion scored the highest plant dry weight after 3 and 6 months from planting whereas after 9 months, applying 2.0% bitumen emulsion gave the heaviest plant dry weight.
13. Plant dry weight of *Acacia surpassed* significantly those of *Leucaena* after 3 and 9 months, whereas planting *Leucaena leucocephala* gave highest dry weight/plant after 6 months.
14. Adding of 2.0% polyvinyl acetate to Acacia saligna, the highest significant increase in plant dry weight after 3 months while after 6 and 9 months from planting, applying 2.5% bitumen emulsion with growing Leucaena plants caused the highest values in plant dry weight.

Soil stability :

Soil samples were collected three times i.e. before planting (as control), after 6 months and after 9 months from planting to study the changes in soil aggregates in relation to the effect of the two studied plant species and the

nine chemical stabilizer treatments concentrations of bitumen emulsion as well as polyvinyl acetate. The main results could by reported as follows :

A. Effect of chemical stabilizers :

Two chemical stabilizers (bitumen emulsion and polyvinyl acetate) with four concentrations for each one and water as control were followed. The main results are:

1. Changes in soil aggregates were observed by spraying the chemical stabilizer under the probability of 5% level of significance after 6 and 9 months from planting.
2. After 6 months from planting application increases of bitumen emulsion up to 1.5% caused decrease in very coarse, fine and very fine particles.
3. After 6 months from planting, applying 2.0% polyvinyl acetate scored increases in very coarse and coarse fraction whereas applying 1.5% bitumen emulsion caused an increase in medium particles.
4. After 9 months from planting, significant differences were obtained as a result by applying chemical stabilizers. Applying 2.0% polyvinyl acetate increased very coarse and coarse while adding 1.5% bitumen emulsion caused an increase in medium particles after 6 months from planting.
5. After 9 months after planting, applying chemical stabilizer differed significantly where application of 2.0% polyvinyl acetate increased coarse as well as medium aggregates.
6. Very coarse, fine and very fine aggregates differed. Applying 1.0% polyvinyl acetate and 1.5% bitumen

emulsion, increased the two mentioned aggregates, respectively.

B. Effect of plant species :

1. Significant differences were apparent as affected by plant species on various soil aggregates at 6 and 9 months after planting.
2. *Leucaena* surpassed *Acacia* significantly in very coarse, coarse, medium and fine after 6 months from planting.
3. *Acacia* caused an increase in very fine aggregates after 6 months from planting and these increases reached the 5% level of significance.
4. At 9 months from planting, *Acacia* planting increased coarse and very fine aggregates significantly.
5. Very coarse, medium and fine aggregates increased significantly with growing *Leucaena* after 9 months from planting.
6. In respect to the average of the two periods (6 and 9 months) *Leucaena* out-weiged very coarse, medium and fine aggregates, while *Acacia* tended to increase very fine aggregate which in turn in soil stability.

C. Effect of interaction between soil stability x plant species:

1. Statistical differences were obtained as influenced by interaction between soil stability x plant species.
2. At 6 months from planting, adding 2% polyvinyl acetate and planting *Leucaena* gave the highest values

of very coarse aggregates and that increase reached the 5% level of significance.

3. At 9 months from planting, applying 1.5% or 2.0% bitumen emulsion gave the highest very coarse aggregates.
4. Planting *Leucaena* and spraying 1.5% bitumen gave highest increase in coarse after 6 months from planting, whereas at 9 months, planting *Acacia* and spraying 1.5% bitumen caused significant value in coarse aggregates.
5. Significant different appeared in medium aggregates as affected by chemical stabilizer treatment x plant species.
6. Generally, fine aggregates increased significantly after 6 and 9 months from planting as affected by chemical stabilizer treatments x plant species.
7. Applying 1.5% bitumen emulsion and *Leucaena* planting increased fine aggregates significantly at 6 months from cultivation, while at 9 months, fine aggregate increased by the application of 1.0% bitumen and *Acacia* planting .
8. Spraying 2.0% bitumen emulsion X *Acacia* planting caused significant increases in very fine aggregates after 6 months from planting, while applying 1.5% polyvinyl acetate gave the highest values of very fine aggregates after 9 months from planting.