VI. SUMMARY

The effects of VAM fungus, *Glomus geosporum* and *Azospirillum brasilense* on plant growth and biocontrol of *Verticillium dahliae*, the wilt pathogen, in two high yielding and widely cultivated varieties MCU-5 and MCU-9 of cotton (*Gossypium hirsutum*), were studied in an experimental condition. Cotton plants were treated with *G. geosporum* (*G*), *A. brasilense* (*A*) and *V. dahliae* (*V*) individually as well as in combination (*G. geosporum* + *A. brasilense* (*GA*), *G. geosporum* + *V. dahliae* (*GV*), *A. brasilense* + *V. dahliae* (*AV*) and *G. geosporum* + *A. brasilense* + *V. dahliae* (*GAV*). Growth, physiological and biochemical characters were studied from 20 d to 120 d at the interval of 20 d from the day of emergence of the seedling. The results are presented below:

1. Per cent VAM infection was very high in GV plants (MCU-9: 68% and MCU-5: 74%) followed by GA and G plants. In GAV plants the infection was considerably reduced.

2. On 80th d, the rhizosphere of GA plants showed maximum *Azospirillum* population followed by A plants. In AV and GAV, the bacterial population was less.

3. *V. dahliae* population was higher in the rhizosphere of V plants followed by AV and GAV plants. In GV plants, the population was less and on 80th d no microsclerotium was found in the soil.

4. V plants were highly affected by the disease incidence followed by AV and GAV plants. In GV plants of MCU-5, there was no disease severity but in MCU-9, the initial appearance of disease severity (2%) was nullified from 40th d onward.

5. Plant height and biomass were at their maximum in GV plants followed by GA, G and A plants. V, AV and GAV plants were stunted with low amount of biomass.

6. GV plants contained more moisture content than GA, G and AV plants and while V, AV and GAV plants contained less amount.
7. High chlorophyll content was found in GV plants followed by GA, G and A plants. In V, AV and GAV plants, it decreased.

8. Photosynthetic activity was higher in GV plants followed by GA, G and A plants.

9. Level of reducing sugars of leaves was very high in GV plants compared to GA, G and A plants while in roots it was at its maximum level in GA plants followed by GV, G and A plants while, V, AV, GAV had minimum amount.

10. GA plants had more amount of total soluble sugar than GV, G and A plants. However, decreased level was found in V, AV and GAV plants.

11. In leaves, amino acid level was very high in GA plants followed by A, GV and G plants of both varieties but in roots of MCU-5, GA plants showed high content followed by GV, A and G plants and in MCU-9, GV plants exhibited maximum followed by GA, A and G plants. In V, AV and GAV plants of both varieties the content reduced.

12. O-dihydric phenol was higher in GV plants than in GA and G plants and in A plants it was not detected. V, AV and GAV plants showed decreased level.

13. Maximum amount of total phenols was recorded in GV plants followed by GA and G plants while in V, AV and GAV the level was less. A plants showed no significant increase.

14. Leaf protein content was higher in GA plants than in A, G and GV plants. But in roots, the level in MCU-9 was at its maximum in GA plants followed by A, G and GV plants while in MCU-5, A plants were followed by GV, GA and G plants. Minimum level was observed in V, AV and GAV plants.

15. In MCU-5, the cytokinin level of leaves was high in GV plants followed by GA and G plants but in MCU-9, GA plants had more amount of cytokinin than GV and G plants. V, AV and GAV had decreased level of cytokinin. A plants had no significant increase in cytokinin content.
16. Maximum level of phosphorus was found in GA plants followed by GV, G and A plants. In V, AV and GAV, the content was very low.

17. Nitrogen level was high in GA plants followed by A, GV and G plants. Highly decreased level of nitrogen was found in V, AV and GAV plants.

18. More amount of potassium was recorded in GA plants followed by GV, G and A plants. Minimum level was encountered in V, AV and GAV plants.

19. Phenol oxidase and phenylalanine ammonia-lyase activity increased in GV, GA and G plants and subsequently decreased to reach the level of control plants whereas in V, AV and GAV plants an initial increase in enzyme activities was followed by a rapid decreased activities of these enzymes.

20. The biocontrol activity of GV plants may be due to the increased level of phosphorus, reducing sugar, protein, cytokinin, phenols, o-dihydric phenol and enhanced activities of defense enzymes such as phenol oxidase and phenylalanine ammonia-lyase along with the high percentage of arbuscules and total colonization ratio.

21. AV plants and GAV plants became susceptible and this may be due to some toxic substance or substances that might have formed due to the interaction between *Azospirillum* and *Verticillium* in rhizosphere.