CHAPTER- VI
SUMMARY AND CONCLUSION
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Soya bean (*Glycine max* L.)

The treatment T10 has recorded significantly higher plant height of 53.29 cm closely followed by treatment T9 (42.06 cm), T7 (45.13 cm), T4 (43.05 cm) when compared to the rest of the treatment and lower with control (33.68 cm) at harvest.

The leaves per plant were significantly higher with the treatment T10 (24.06) at harvest, when compared to all other treatment and least were recorded with T1 (12.23).

The number of branches per plant were recorded significantly higher in treatment T10 and T7, T4 (11.23, and 6.45, 6.12) at harvest. Least was recorded with T1 (3.79) when compared to the rest of the treatment.

The treatment T10 recorded significantly the higher number of pods per plant (41.52) when compared to all other treatment and lowest was recorded with T1 (24.13).

The treatment T10, T7 and T4 recorded significantly highest pod yield per plant (12.70 g, 11.59 g, and 1.41 g) and lowest with T1 (7.32 g).

The total pod yield ha⁻¹ was recorded significantly higher in the treatment T10 (2267.85 kg) followed by T7 (2069.64 kg), T4 (2037.50 kg) and T9 (1987.50 kg) respectively. And least was with T1 (1307.14 kg ha⁻¹).

The dry weight of leaves was recorded significantly higher in the treatment T10 (5.47) as compared to all other treatments and least was with T1 (3.11).

The dry weight of stem was recorded significantly higher in the treatment T10 (6.89) as compared to all other treatments. This was followed by treatments T7 (5.98), T4 (5.90), T9 (5.40), and less weight of stem with T1 (3.80).
The dry weight of pods was recorded significantly higher in the treatment T10 (15.17) as compared to all other treatments. This was followed by treatments T7 (14.36), T4 (14.25), and T9 (14.10), and less dry weight of pods with T1 (8.49).

The total dry weight of the plant was recorded significantly higher in the treatment T10 (27.53) as compared to all other treatments. This was followed by treatments T7 (25.12) and T4 (24.67) and the lowest dry weight of plant with T1 (15.4).

The treatment T10 recorded significantly higher chlorophyll a (1.121), as compared to all other treatments. This was followed by treatments T7 (1.041), T4 (1.031) and T9 (1.013). T1 control recorded significantly less content (0.651) of chlorophyll a. In chlorophyll b T10 recorded significantly higher value (0.495), as compared to all other treatments. The T1 control recorded significantly less content (0.201) of chlorophyll b.

The total chlorophyll content a and b was recorded significantly higher in the treatment T10 (1.616) as compared to all other treatments. This was followed by treatments T7 (1.46) and T4 (1.441) and the lowest chlorophyll a and b with T1 (0.852).

Treatment 10 recorded higher available N, P, K (279, 21, 200 kg ha\(^{-1}\) respectively) in soil and lower with control (T1- 270, 15, 170 kg ha\(^{-1}\) respectively).

Significant positive correlation was observed between pod yield and growth components viz., plant height (0.955), number of leaves plant\(^{-1}\)(0.923) and number of branches (0.789).

Significant positive correlation was observed between pod yield and yield components viz., number of pods plant\(^{-1}\) and pod yield plant\(^{-1}\) (0.998).
French bean (*Phaseolus vulgaris* L.)

The treatment TIO has recorded significantly higher plant height (43.98 cm) closely followed by treatment T7 (38.72 cm), T4 (35.31 cm) and T9 (34.61 cm) when compared to the rest of the treatment and lower with control (16.72 cm) at harvest.

The leaves per plant were significantly higher with the treatment TIO (15.80) at harvest, when compared to all other treatment and least were recorded with T1 (6.32).

The number of branches per plant were recorded significantly higher in treatment T10 and T7, T4 (14.10, and 8.89, 6.07) at harvest. Least was recorded with T1 (3.23) when compared to the rest of the treatment.

The treatment TIO recorded significantly the higher number of pods per plant (18.90) when compared to all other treatment and lowest was recorded with T1 (11.00).

The treatment T10, T7 and T4 recorded significantly highest pod yield per plant (48.38 g, 40.77 g, and 37.72 g) and lowest with T1 (23.21 g).

The total pod yield ha\(^{-1}\) was recorded significantly higher in the treatment T10 (8639 kg) followed by T7 (7288 kg), T4 (6735 kg) and T9 (6391 kg), respectively. And least was with T1 (4144 kg ha\(^{-1}\)).

The dry weight of leaves was recorded significantly higher in the treatment T10 (6.30) as compared to all other treatments. Least was with T1 (3.98).

The dry weight of stem was recorded significantly higher in the treatment T10 (4.56) as compared to all other treatments. This was followed by treatments T7 (4.30), T4 (4.21), T9 (4.18), and less weight of stem with T1 (3.42).
The dry weight of pods was recorded significantly higher in the treatment T10 (14.10) as compared to all other treatments. This was followed by treatments T7 (13.89), T4 (13.38), and T9 (13.05) and less dry weight of pods with T1 (8.39).

The Total dry weight of the plant was recorded significantly higher in the treatment T10 (24.96) as compared to all other treatments. This was followed by treatments T7 (24.19) and T4 (23.51) and the lowest dry weight of plant with T1 (15.79).

The treatment T10 recorded significantly higher chlorophyll a (1.360), as compared to all other treatments. This was followed by treatments T7 (1.051), T4 (1.021) and T9 (0.961). The T1 control recorded significantly less content (0.656) of chlorophyll a. In chlorophyll b T10 recorded significantly higher value (0.458), as compared to all other treatments. The T1 control recorded significantly less content (0.261) of chlorophyll b.

The Total chlorophyll content a and b was recorded significantly higher in the treatment T10 (1.552) as compared to all other treatments. This was followed by treatments T7 (1.497) and T4 (1.432) and the lowest chlorophyll a and b with T1 (0.917).

Treatment T1 recorded lower available N, P, K (274, 14, 168 kg ha\(^{-1}\) respectively) in soil and higher with T10 (T10- 300, 22, 210 kg ha\(^{-1}\) respectively).

Significant positive correlation was observed between pod yield and growth components viz., plant height (0.795), number of leaves plant\(^{-1}\) (0.858) and number of branches (0.951). Significant positive correlation was observed between pod yield and yield components viz., number of pods plant\(^{-1}\) and pod yield plant\(^{-1}\) (0.985).
Conclusion

The yield of the crop directly depends on various environmental factors such as the availability of sunlight, \( \text{CO}_2 \) and many nutrients in the soil. All these parameters are interrelated for the effective production of the yield of any crop. Hence, any of the parameter or nutrient lacking in the environment cause either depletion in the quantity or quality of the yield or the plant dies.

Hence, the nutrient supply is one of the key factors that determines the growth of the plant / crop. Micro or macro nutrients serve as primary and secondary nutrients in plant nutrition. The quantity of the nutrients is a major factor, which determines the plant yield and sustenance of the plant. The deficiency of the nutrients is widespread because of the increased demand from more intensive cropping practices. The soil testing and analysis of the plant parameters are outstanding diagnostic tools to monitor the nutrient levels for all the plants, especially the economic crops, which serve as the food and energy basics.

Proper supply of the plant nutrients is one of the splendid process, which enhances the metabolic activity of the plant and in turn enhances the plant growth and again acts on the yield of the plant. The effective growth and yield of the plant can be obtained with the optimum nutrients than the less or even more nutrients in the plant environment.

Bio fertilizers are living microorganisms, which contribute nutrients to plants through microbial activity. These microbial cultures fix atmospheric nitrogen, solubilizing both native and applied sparingly soluble phosphate to increase soil fertility.
Bio fertilizers have emerged as a promising component of integrating nutrient supply system in agriculture. Our whole system of agriculture depends in many important ways, on microbial activities and there appears to be a tremendous potential for making use of micro-organisms increasing crop production. Microbiological fertilizers are environment friendly. Bio fertilizers include mainly the nitrogen fixing, phosphate solubilizing and plant growth promoting microorganisms. Bio fertilizers improve soil texture, structure, supply nutrients, water holding capacity and proliferate useful soil organisms unlike chemical fertilizers. Further, bio fertilizer increases soil fertility by loosening the soil and improving the soil texture.

The application of bio fertilizer accumulated more nutrients to support better growth and yield in crops. Bio fertilizer contains various types of useful enzymes and microorganisms which increase both plant growth and productivity. Bio fertilizers also prevent the soil erosion. Bio fertilizer involves the preparation of efficient strains of microorganism's capable of converting atmospheric nitrogen into nitrate or Solubilizing phosphorus from the fixed form. Bio fertilizers are non-toxic and pollution free.

In the present study, field experiments were conducted for a period of two years at regular intervals of two seasons. Both Soya bean and French bean crops were experimented using different combination of treatments. The results were compared with each treatment and found that considerable significant changes from the point of sowing up to harvest. From the current research work, it has been concluded that the treatments which have received the combination of different dosage of bio fertilizers have recorded significantly higher growth parameters, dry matter accumulation, chlorophyll content and the yield of the crops. The present study evidenced that among the various treatments, the combined application of bio fertilizers is the best method for increasing the crop growth, yield and most important it maintains the soil fertility.
Recommendations

1. The present scientific investigations emphasized field and lab experiments.

2. Accordingly farmers may adopt treatment T10 (FYM + Vermicompost + Rhizobium + PSB) for improving the soil quality as well as better yield in soya bean.

3. The farmers may adopt treatment T4 and T7 for better yield.

4. Treatment like FYM, Vermicompost and PŚB alone shows better results but not up to the expected yield. Therefore the dosage levels must be increased.

5. Similarly in French bean as per the studies, treatment T10 (FYM + Vremicompost + Poultry manure + PSB) is suitable for good yield and quality. This is followed by T4, T7 and T9 which can be recommended to the farmers for larger production and maintain of soil quality and economics.

6. As per the studies it is observed that the usage of chemical fertilizer degrade and create the environmental pollution so it is recommended that farmers instead of using chemical fertilizer should adopt bio fertilizers for cultivation methods.

Future Line of Work

1. There is a need to investigate further improvement of dosage level of bio fertilizer to get still better yield.

2. There is a need to investigate further in the bio chemical parameters like ascorbic acid, nitrate, and sugar content etc.

3. There is a need to investigate further to study the interaction of bio fertilizer and chemical fertilizer with heavy metals in enhancing the growth and yield of the crops.

4. There is a need to study the biological characteristic of the soil in order to understand the overall impact of bio fertilizer on the improvement of crop yield.