CHAPTER- IV

EXPERIMENTAL RESULTS
EXPERIMENTAL RESULTS

The experiments were conducted to find out the impact of bio fertilizer and chemical fertilizer on Soya bean and French bean. The experiment was carried out for the period of two years from 2009 to 2011. The results of the field and laboratory experiments are presented in this chapter.

1. Soya bean (*Glycine max*)

Growth Parameters

**Plant height (cm)**

Fig 4.1 represents the influence of bio fertilizer and chemical fertilizer on plant height (cm) at different stages of Soya bean.

At 20 days among the treatments the T10 (FYM + Rhizobium + Vermicompost + PSB) recorded the higher plant height (25.06 cm) followed by T7 (24.71 cm), T4 (24.23 cm), T9 (24.10 cm). The T1 (control) recorded the lowest plant height of (13.43 cm) and the remaining treatments T2, T3, T5, T6 and T8 similar to each other.

At 40 days, the treatments T10 (FYM + Rhizobium + Vermicompost + PSB) have significantly higher plant height (45.83 cm) over control (25.54 cm). However the treatments T7 (43.05 cm), T4 (42.70 cm) and T9 (40.81 cm) shows the increasing trend i.e, T7 > T4 > T9.

At 60 days, the treatment T10 (FYM + Rhizobium + Vermicompost + PSB) showed significantly higher plant height of 53.29 cm, as compared to all other treatments. This was followed by treatments T9 (42.06 cm), T7 (45.13 cm) T4 (43.05 cm). Treatment T1
control recorded the significantly lower plant height of 33.68 cm as compared to the rest of the treatments.

**Number of Branches**

Fig 4.2 represents the influence of bio fertilizer and chemical fertilizer on number of branches at different stages of Soya bean.

At 20 days among the treatments T10 (FYM+ Rhizobium +Vermicompost+ PSB) recorded the maximum number of branches (4.28) when compared to all other treatments. And was followed by T9 (3.03), T7 (3.81) and T4 (3.41). The T1 (control) recorded the least number of branches per plant (1.33).

At 40 days, the treatments T10 (FYM+ Rhizobium +Vermicompost+ PSB) recorded the maximum number of branches (7.01) over control (2.64). However the treatments, T7 (5.03), T4 (4.23) and T9 (4.10) shows the increasing trend i.e., T7 > T4 > T9 and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days, the treatments T10 (FYM+ Rhizobium +Vermicompost+ PSB) recorded maximum number of branches of (11.23), as compared to all other treatments, this was followed by treatments T9 (5.80), T7 (6.45.) and T4 (6.12). Treatment T1 (control) recorded the least number of branches of 3.79 as compared to the rest of the treatments.
Fig: 4.1. Influence of bio fertilizer and chemical fertilizer on plant height (cm) at different stages of Soya bean.

Fig: 4.2. Influence of bio fertilizer and chemical fertilizer on number of branches at different stages of Soya bean.
Number of leaves

Fig 4.3 represents the influence of bio fertilizer and chemical fertilizer on the growth of number of leaves at different stages of Soya bean.

At 20 days among the treatments the T10 (FYM+ Rhizobium +Vermicompost+ PSB) recorded the maximum number of leaves (6.23) followed by T7 (5.62), T4 (5.40), T9 (4.98). The T1(control) recorded the minimum number of leaves (3.10) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

At 40 days, the treatments T10 (FYM+ Rhizobium +Vermicompost+ PSB) have significantly maximum number of leaves (13.36) over control (7.32). However the treatments T7 (11.64), T4 (11.30) and T9 (11.20) were shows increasing trend i.e., T7 > T4 > T9.

At 60 days, the treatment T10 (FYM+ Rhizobium +Vermicompost+ PSB) caused significantly higher number of leaves (24.06), as compared to all other treatments. This was followed by treatments T7 (21.92), T4 (21.32) T9 (20.18). Treatment T1 (control) recorded the significantly less number of leaves (12.23) as compared to the rest of the treatments.
Yield Parameters

Number of pods

Fig 4.4 represents the influence of bio fertilizer and chemical fertilizer on number of pods per plant at different stages of Soya bean.

At 40 days among the treatments T10 (FYM + Rhizobium + Vermicompost + PSB) recorded the maximum number of pods (25.07) when compared to all other treatments. And was followed by T7 (23.92), T9 (23.25) and T4 (23.59). The T1 (control) recorded the minimum number of pods per plant (14.34).

During harvesting, the treatments T10 (FYM + Rhizobium + Vermicompost + PSB) recorded the maximum number of pods (41.52) over control (24.13). However the
treatments T7 (37.89), T4 (37.30) and T9 (37.10) shows the increasing trend and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

**Total pods yield per plot**

Fig 4.5 represents the influence of bio fertilizer and chemical fertilizer on the total pods yield per plot at different stages of Soya bean.

During the harvesting, the total pods yield was estimated and found to be maximum at T10 (FYM+ Rhizobium +Vermicompost+ PSB) (12.70 g) followed by T7 (11.59 g), T4 (11.41 g) and T9 (11.13 g). The T1 (control) recorded the minimum yield (7.32 g) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

**Total yield per hectare**

Fig 4.6 represents the influence of bio fertilizer and chemical fertilizer on the total yield per hectare at different stages of Soya bean.

During the harvesting, the total pods yield was estimated and found to be maximum at T10 (2267.85 kg) followed by T7 (2069.64 kg), T4 (2037.50 kg) and T9 (1987.50 kg). The T1 (control) recorded the minimum yield (1307.14 kg) and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

**Dry matter production**

**Dry weight of the leaves**

Fig 4.7 represents the influence of bio fertilizer and chemical fertilizer on the dry weight of the leaves at different stages of Soya bean recorded during the study.
At 20 days, among all the treatments studied, T10 (FYM + Rhizobium + Vermicompost + PSB) recorded the maximum dry weight of the leaves (2.82) followed by T7 (2.10), T4 (2.05), T9 (2.00). The T1 (control) recorded the minimum dry weight of leaves (1.10) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

At 40 days, the treatments T10 (FYM + Rhizobium + Vermicompost + PSB) has significantly maximum dry weight of leaves (4.25) over control (2.82). However the treatments T4 (3.90), T7 (3.98) and T9 (3.65) showed an increasing trend i.e, T7 > T4 > T9.

At 60 days, the treatment T10 (FYM + Rhizobium + Vermicompost + PSB) caused significantly higher dry weight of leaves (5.47), as compared to all other treatments. This was followed by treatments T7 (4.78), T4 (4.52), T9 (4.32). Treatment T1, the control recorded significantly less dry weight of leaves (3.11) as compared to the rest of the treatments. The rest of the treatments have showed the similar results.
Fig: 4.4. Influence of bio fertilizer and chemical fertilizer on number of pods per plant at different stages of Soya bean

Fig: 4.5. Influence of bio fertilizer and chemical fertilizer on total pods yield per plot.
Fig. 4.6. Influence of bio fertilizer and chemical fertilizer on total yield per hectare at different stages of Soya bean.

Fig: 4.7. Influence of bio fertilizer and chemical fertilizer on dry weight of leaves at different stages of Soya bean
Dry weight of the stem

Fig 4.8 represents the influence of bio fertilizer and chemical fertilizer on the dry weight of the stem at different stages of Soya bean recorded during the study.

At 20 days among all the treatments studied the T10 (FYM + Rhizobium + Vermicompost + PSB) recorded the maximum dry weight of the stem (3.06) followed by T7 (2.72), T4 (2.61), T9 (2.60). The T1 (control) recorded the minimum dry weight of the stem (1.73) and the remaining treatments T2, T3, T5, T6 and T8 showed similar results to each other.

At 40 days, the treatments T10 (FYM + Rhizobium + Vermicompost + PSB) have significantly maximum dry weight of stem (5.14) over control (2.89). However the treatments T9 (4.45), T4 (4.70) and T7 (4.78), showed increasing trend T7 > T4 > T9 and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days during the harvesting, the treatment T10 showed significantly higher dry weight of the stem (6.89), as compared to all other treatments. This was followed by treatments T7 (5.98), T4 (5.90), T9 (5.40). Treatment T1, the control recorded significantly less dry weight of stem (3.80) as compared to the rest of the treatments. The rest of the treatments have showed the results on par with each other.

Dry weight of the pods

Fig 4.9 represents the influence of bio fertilizer and chemical fertilizer on the dry weight of the pods at different stages of Soya bean recorded during the study.
At 40 days among all the treatments studied the T10 (FYM+ Rhizobium +Vermicompost+ PSB) recorded the maximum dry weight of the pods (3.20) followed by T7 (2.66), T4 (2.56), T9 (2.41). However the T1 (control) recorded the minimum dry weight of pods (1.13) and the remaining treatments followed a decreasing trend is as per T2, T3, T5, T6 and T8.

At 60 days, the treatment T10 (FYM+ Rhizobium +Vermicompost+ PSB) showed significantly higher dry weight of pods (15.17), as compared to all other treatments. However the treatments T9 (14.10), T4 (14.25) and T7 (14.36) exhibited increasing trend i.e., T7 > T4 > T9. Treatment T1, the control recorded the significantly less dry weight of the pods (8.49) as compared to the rest of the treatments. The rest of the treatments have showed the results similar to each other.

**Total dry weight of the plant**

The total dry weight of the plant was recorded to understand the influence of bio fertilizer and chemical fertilizer on different stages of Soya bean (fig 4.10).

At 20 days among all the treatments studied, the treatment T10 recorded the maximum total dry weight of the plant (5.88) followed by T7 (4.82), T4 (4.66), T9 (4.4). The T1(control) recorded the minimum dry weight of the plant (2.83) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

The observation shows that at 40 days, the treatments T10 recorded significantly maximum total dry weight of plant (24.56) over the control (6.84). However, the
treatments T9 (10.44), T4 (11.16) and T7 (11.42), exhibited an increasing trend i.e, T7 > T4 > T9.

At the time of harvesting, the treatment T10 showed significantly higher dry weight of the plant (27.53), as compared to all other treatments. This was followed by treatments T7 (25.12), T4 (24.67), T9 (23.8). Treatment T1, the control recorded significantly less dry weight of plant (15.4) as compared to the rest of the treatments. The rest of the treatments showed similar to each other.

Fig: 4.8. Influence of bio fertilizer and chemical fertilizer on dry weight of stem at different stages of Soya bean.
Chapter 4

Experimental Results

Fig. 4.9. Influence of bio fertilizer and chemical fertilizer on dry weight of pods at different stages of Soya bean

Fig. 4.10. Influence of bio fertilizer and chemical fertilizer on total dry weight of the plant of Soya bean
Bio chemical parameter

Chlorophyll a and b

Fig 4.11 represents the influence of bio fertilizer and chemical fertilizer on the chlorophyll a and b produced at different stages of Soya bean recorded during the study.

In general, the chlorophyll a and b differed significantly from 40 days to Harvest.

At 40 days, the treatments T10 (FYM+ Rhizobium +Vermicompost+ PSB) have significantly maximum of chlorophyll a (1.310) over control (1.011). However the treatments T9 (1.220), T4 (1.225) and T7 (1.230), were shows the increasing trend i.e, T7 >T4 >T9 and the remaining treatments, while T2, T3, T5, T6 and T8 were found to be on par with each other.

At 60 days, the treatment T10 (FYM+ Rhizobium +Vermicompost+ PSB) caused significantly higher chlorophyll a (1.121), as compared to all other treatments. This was followed by treatments T7 (1.041), T4 (1.031), T9 (1.013). Treatment T1, the control recorded the significantly less content (0.651) as compared to the rest of the treatments.

At 40 days, the treatments T10 (FYM+ Rhizobium +Vermicompost+ PSB) have significantly maximum of chlorophyll b (0.890) over control (0.421). However the treatments T7 (0.826), T4 (0.813), T9 (0.792) exhibited increasing trend and the remaining treatments, while T2, T3, T5, T6 and T8 were found to be similar to each other.
At 60 days, the treatment T10 (FYM + Rhizobium + Vermicompost + PSB) showed significantly higher chlorophyll b (0.495), as compared to all other treatments. This was followed by treatments T7 (0.419), T4 (0.410), T9 (0.345). Treatment T1, the control recorded the significantly less content (0.201) as compared to the rest of the treatments.

**Total Chlorophyll a and b**

Fig 4.12 represents the influence of bio fertilizer and chemical fertilizer on the total chlorophyll a and b produced at different stages of Soya bean recorded during the study. In general, the chlorophyll A and B differed significantly from 40 days to Harvest.

At 40 days, the treatments T10 (FYM + Rhizobium + Vermicompost + PSB) have significantly maximum of chlorophyll a and b (2.2) over control (1.432). However the treatments T7 (2.056), T4 (2.038) and T9 (2.012) were showed the increasing trend the T7 > T4 > T9 and the remaining treatments, while T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days (during harvesting), the treatment T10 (FYM + Rhizobium + Vermicompost + PSB) showed significantly higher chlorophyll a and b (1.616), as compared to all other treatments. This was followed by treatments T7 (1.46), T4 (1.441), T9 (1.346). Treatment T1, the control recorded the significantly less content of chlorophyll a and b (1.133) as compared to the rest of the treatments.
Fig: 4.11. Influence of bio fertilizer and chemical fertilizer on chlorophyll a and chlorophyll b at different stages of Soya bean.

Fig: 4.12. Influence of bio fertilizer and chemical fertilizer on total chlorophyll a and b at different stages of Soya bean.
Available nitrogen, phosphorus and potassium status in soil after harvest of the crop as influenced by different treatments

Data on available nitrogen, phosphorus and potassium content in soil after harvest of the crop is presented in the fig 4.13.

**Available Nitrogen**

The Treatment T10 recorded significantly higher available nitrogen in soil (279 Kg ha\(^{-1}\)) and closely related to T7 and T4. Treatment 1 – control recorded lower available nitrogen in soil (270 Kg ha\(^{-1}\)) as compared to rest of the treatments.

**Available Phosphorus**

The Treatment T10 recorded significantly higher available phosphorus in soil (21 Kg ha\(^{-1}\)) and closely related to T7 and T4. Treatment 1 – control recorded lower available phosphorus in soil (15 Kg ha\(^{-1}\)) as compared to rest of the treatments.

**Available potassium**

The Treatment T10 recorded significantly higher available potassium in soil (200 Kg ha\(^{-1}\)) and closely related to T7 and T4. Treatment 1 – control recorded lower available potassium in soil (170 Kg ha\(^{-1}\)) as compared to rest of the treatments.
Fig: 4.13. Available nitrogen, phosphorus and potassium Kg/ha content in soil after harvest of the crops.

Table: 4.14. Correlation of co-efficient between pod yields, growth yield attributes as influenced by bio fertilizer and chemical fertilizer on soya bean

<table>
<thead>
<tr>
<th>A. Pod yield with growth attributes</th>
<th>Number of branches</th>
<th>Number of leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant height</td>
<td>0.955</td>
<td>0.923</td>
</tr>
<tr>
<td>Number of branches</td>
<td></td>
<td>0.789</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Pod Yield with yield attributes</th>
<th>Number of pods per plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pod yield per plant</td>
<td>0.998</td>
</tr>
</tbody>
</table>
Karl Pearson correlation coefficient was calculated among the different parameters of the plant such as the height of the plant, number of branches produced and the number of leaves. The yield of the plant and the number of the plants grown were also calculated for ‘r’. It has exhibited significant positive correlation among all the parameters, thus revealing the significant influence of the plant height and the number of branches and leaves grown as a healthy way of growth. The yield of the pods has revealed significant positive relationship with the number of pods per plant. These results clearly depict the well growth of the plant, which was influenced by the use of bio fertilizer and chemical fertilizer on the growth and yield attributes of soya bean.
II. French bean (*Phaseous vulgaris*)

**Growth Parameters**

**Plant height (cm)**

Fig 4.14 represents the influence of bio fertilizer and chemical fertilizer on plant height (cm) at different stages of French bean.

At 20 days among the treatments the T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded maximum plant height of 25.07 cm followed by T7 (20.26 cm), T4 (20.06 cm). The T1(control) recorded the minimum plant height of 10.12 cm and the remaining treatments T2, T3, T5, T6, T8 and T9 were similar to each other.

At 40 days, the treatments T10 (FYM+ Poultry manure + Vermicompost +PSB) showed significantly higher plant height (36.45 cm) over the control (14.53 cm). However, the treatments T9 (30.65 cm), T4 (32.19 cm) and T7 (35.01 cm), exhibited the increasing trend i.e, T7 > T4 > T9 and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days (during harvesting), the treatment T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded significantly higher plant height (43.98 cm), as compared to all other treatments. This was followed by treatments T7 (38.72 cm), T4 (35.31 cm) T9 (34.61 cm). Treatment T1 control recorded significantly lower plant height of 16.72 cm as compared to the rest of the treatments.
Number of Branches

Fig 4.15 represents the influence of bio fertilizer and chemical fertilizer on number of branches at different stages of French bean.

The observation shows that at 20 days among the treatments T10 (FYM + Poultry manure + Vermicompost + PSB) recorded the maximum number of branches (6.33) when compared to all other treatments and was followed by T7 (5.12), T9 (4.25), T4 (4.02) and T5 (4.02). The T1 (control) recorded the least number of branches per plant (1.80).

Further at 40 days, the treatments T10 (FYM + Poultry manure + Vermicompost + PSB) recorded the maximum number of branches (8.56) over the control (2.50). However, the treatments T7 (6.20), T4 (5.02), T9 (4.60), shows an increasing trend i.e., T7 > T4 > T9 and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days, the treatments T10 (FYM + Poultry manure + Vermicompost + PSB) recorded maximum number of branches (14.10), as compared to all other treatments. This was followed by treatments T7 (8.89), T4 (6.07), T9 (5.92). Treatment T1 (control) recorded the least number of branches of (3.23) as compared to the rest of the treatments.
Fig: 4.14. Influence of bio fertilizer and chemical fertilizer on plant height (cm) at different stages of French bean

Fig: 4.15. Influence of bio fertilizer and chemical fertilizer on number of branches at different stages of French bean
Number of leaves

Fig. 4.16 represents the influence of bio fertilizer and chemical fertilizer on the number of leaves at different stages of French bean.

At 20 days among the treatments T10 (FYM + Poultry manure + Vermicompost + PSB) recorded the maximum number of leaves (6.24) followed by T9 (4.60), T4 (4.61) and T7 (5.56), which shows an increasing trend. The T1 (control) recorded the minimum number of leaves (1.89) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

At 40 days, the treatments T10 (FYM + Poultry manure + Vermicompost + PSB) recorded significantly maximum number of leaves (13.13) as compared to control (3.96). However, the treatments T7 (8.10), T4 (8.00), T9 (7.90) exhibited an increasing trend and the remaining treatments T2, T3, T5, T6 and T8 were found to be on par with each other.

Further at 60 days, the treatment T10 (FYM + Poultry manure + Vermicompost + PSB) supported significantly higher number of leaves (15.80), as compared to all other treatments. This was followed by treatments T7 (10.48), T4 (10.01) T9 (9.90). Treatment T1 control recorded significantly less number of leaves (6.32) as compared to the rest of the treatments.
Fig: 4.16. Influence of bio fertilizer and chemical fertilizer on number of leaves at different stages of French bean.

Yield Parameters

Number of pods

Fig: 4.17 shows the influence of bio fertilizer and chemical fertilizer on number of pods per plant at different stages of French bean.

At 40 days among the treatments T10 (FYM + Poultry manure + Vermicompost +PSB) recorded the maximum number of pods (8.96) when compared to all other treatments. And was followed by T7 (8.00), T4 (7.56) and T9 (7.29). The T1 (control) recorded the least number of pods per plant (3.69).
During harvesting, the treatments T10 (FYM + Poultry manure + Vermicompost +PSB) recorded the maximum number of pods (18.90) over control (11.00). However, the treatments T7 (17.06), T4 (16.40), T9 (15.70) shows an increasing trend i.e, T7 > T4 > 9 and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

**Total pods per plot**

Fig 4.18 represents the influence of bio fertilizer and chemical fertilizer on the total pods yield per plot at different stages of French bean.

During the harvesting, the total pods yield was estimated and found to be maximum at T10 (FYM + Poultry manure + Vermicompost +PSB) (48.38 kg) followed by T7 (40.77 kg), T4 (37.72 kg) and T9 (35.79 kg). The T1 (control) recorded the minimum yield of 23.21 kg and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

**Total yield per hectare**

Fig 4.19 represents the influence of bio fertilizer and chemical fertilizer on the total yield per hectare at different stages of French bean.

During the harvesting, the total pods yield was estimated and found to be maximum at T10 (FYM + Poultry manure + Vermicompost +PSB) (8639 kg) followed by T7 (7288 kg), T4 (6735 kg) and T9 (6391 kg) as minimum T1 (control) 4144 kg and the remaining treatments T2, T3, T5, T6 and T8 were found to be same results.
Dry Matter Production

Dry weight of the leaves

Fig 4.20 represents the influence of bio fertilizer and chemical fertilizer on the dry weight of the leaves at different stages of French bean recorded during the study.

At 20 days among all the treatments studied the T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded the maximum dry weight of the leaves (1.43) followed by T7 (1.39), T4 (1.39), T9 (1.37). The T1 (control) recorded the minimum dry weight of leaves (1.15).

At 40 days, the treatments T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded significantly maximum dry weight of leaves (5.42) over control (3.04). Never the less, treatments T9 (4.98), T4 (4.98) and T7 (5.15), showed an increasing trend i.e., T7 > T4 > T9 and the remaining treatments T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days, the treatment T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded significantly higher dry weight of leaves (6.30), as compared to all other treatments. This was followed by treatments T7 (6.00), T4 (5.92), T9 (5.30). Treatment T1, the control recorded the significantly less dry weight of leaves (3.98) as compared to the rest of the treatments.
Fig: 4.17. Influence of bio fertilizer and chemical fertilizer on number of pods per plant at different stages of French bean.

Fig: 4.18. Influence of bio fertilizer and chemical fertilizer on total pods yield per plant.
Fig: 4.19. Influence of bio fertilizer and chemical fertilizer on total pod yield per hectare (kg/ha).

Fig: 4.20. Influence of bio fertilizer and chemical fertilizer on dry weight of leaves (g plant$^{-1}$) at different stages of French bean.
Dry weight of the stem

Fig 4.21 represents the influence of bio fertilizer and chemical fertilizer on the dry weight of the stem at different stages of French bean recorded during the study.

At 20 days among all the treatments studied the T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded the maximum dry weight of the stem (1.98) followed by T7 (1.96), T4 (1.95), T9 (1.94). The T1 (control) recorded the minimum dry weight of the stem (1.52) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.

At 40 days, the treatments T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded significantly maximum dry weight of stem (3.85) over the control (2.61). However, the treatments T4 (3.48), T7 (3.51) and T9 (3.60) exhibited increasing trend i.e, T7 > T4 > T9. A similar observation has been made with regard to the treatments T2, T3, T5, T6 and T8.

At 60 days during the harvesting, the treatment T10 (FYM+ Poultry manure + Vermicompost +PSB) showed significantly higher dry weight of the stem (4.56), as compared to all other treatments. This was followed by treatments T7 (4.30), T4 (4.21), T9 (4.18). Treatment T1, the control recorded the significantly less dry weight of stem (3.42) as compared to the rest of the treatments. The rest of the treatments have showed similar results with each other.
Dry weight of the pods

Fig 4.22 represents the influence of bio fertilizer and chemical fertilizer on the dry weight of the pods at different stages of French bean recorded during the study period.

At 40 days among all the treatments studied, the T10 (FYM + Poultry manure + Vermicompost +PSB) recorded the maximum dry weight of the pods (1.68) followed by T7 (1.60), T9 (1.55), T4 (1.51). The T1 (control) recorded the minimum dry weight of pods (1.11).

At 60 days, the treatment T10 (FYM + Poultry manure + Vermicompost +PSB) exhibited a significantly higher dry weight of pods (14.10), as compared to all other treatments. This was followed by treatments T7 (13.89), T4 (13.38), T9 (13.05). Treatment T1, the control recorded significantly less dry weight of the pods (8.39) as compared to the rest of the treatments. The rest of the treatments have showed the results similar to each other.

![Dry weight of stem](figure)

**Fig: 4.21.** Influence of bio fertilizer and chemical fertilizer on dry weight of stem (g plant \(^{-1}\)) at the different stages of French bean.
Fig: 4.22. Influence of bio fertilizer and chemical fertilizer on dry weight of pods (g plant⁻¹) at the different stages of French bean.

Total dry weight of the plant

Fig 4.23 represents the influence of bio fertilizer and chemical fertilizer on the total dry weight of the plant at different stages of French bean recorded during the study period.

At 20 days among all the treatments studied, the treatment T10 recorded the maximum dry weight of the plant (3.41) followed by T7 (3.35), T4 (3.34), T9 (3.28). The T1(control) recorded minimum dry weight of the plant (2.67) and the remaining treatments T2, T3, T5, T6 and T8 were similar to each other.
At 40 days, the treatments T10 recorded significantly maximum dry weight of plant (10.95) over the control (6.76). However, the treatments T9 (9.51), T4 (9.97) and T7 (10.26), exhibited the increasing trend i.e, T7 > T4 > T9.

At the time of harvesting, the treatment T10 showed significantly higher dry weight of the plant (24.96), as compared to all other treatments. This was followed by treatments T7 (24.19), T4 (23.51), T9 (22.36). Treatment T1, the control recorded significantly less dry weight of plant (15.79) as compared to the rest of the treatments. The rest of the treatments showed similar to each other.

Fig: 4.23. Influence of bio fertilizer and chemical fertilizer on total dry weight of the plant at different stages of French bean.
Bio-chemical parameters

Chlorophyll a and b

Fig 4.24 represents the influence of bio fertilizer and chemical fertilizer on the chlorophyll a and b produced at different stages of French bean recorded during the study.

At 40 days, the treatments T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded significantly maximum chlorophyll a content (1.360) over the control (1.012). However, the treatments T9 (1.212), T4 (1.246) and T7 (1.279) exhibited increasing trend and the remaining treatments, T2, T3, T5, T6 and T8 were found to be similar to each other.

At 60 days, 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), T9 (0.961). Treatment T1, the control recorded significantly less chlorophyll a content (0.656) as compared to the rest of the treatments.

At 40 days, the treatments T10 showed significantly maximum chlorophyll b (0.894) over the control (0.501). However, the treatments T9 (0.796), T4 (0.803) and T7 (0.844) exhibited the increasing trend i.e, T7 > T4 >T9 and the remaining treatments, while T2, T3, T5, T6 and T8 were found to be similar with each other.

At 60 days, the treatment T10 (FYM+ Poultry manure + Vermicompost +PSB) recorded significantly higher chlorophyll b (0.458), as compared to all other treatments. This was followed by treatments T7 (0.446), T4 (0.411), T9 (0.400). Treatment T1, the
control recorded significantly less content of the chlorophyll b (0.261) as compared to the rest of the treatments. The rest of the treatments have showed the results on par with each other.

**Total Chlorophyll a and b**

Fig. 4.25 represents the influence of bio fertilizer and chemical fertilizer on the total chlorophyll a and b produced at different stages of French bean recorded during the study.

At 40 days, the treatments T10 have significantly maximum of chlorophyll a and b (2.192) over the control (1.513). However, the treatments T7 (2.123), T4 (2.049), T9 (2.008) shows an increasing trend and the remaining treatments, while T2, T3, T5, T6 and T8 were found to be similar with each other.

At 60 days (during harvesting) the treatment T10 recorded significantly higher chlorophyll a and b (1.552), as compared to all other treatments. This was followed by treatments T7 (1.497), T4 (1.432), T9 (1.34). Treatment T1, the control recorded the significantly less chlorophyll a and b content (0.917) as compared to the rest of the treatments.
Fig: 4.24. Influence of bio fertilizer and chemical fertilizer on chlorophyll a and chlorophyll b at different stages of French bean.

Fig: 4.25. Influence of bio fertilizer and chemical fertilizer on total chlorophyll a and b at different stages of French bean.
Available nitrogen, Phosphorus and potassium status in soil after harvest of the crop as influenced by different treatments

Data on available nitrogen, phosphorus and potassium content in soil after harvest of the crop presented in fig 26.

Available Nitrogen

The Treatment T10 recorded significantly higher available nitrogen in soil (300 Kg ha\(^{-1}\)) and closely related to T7 and T4. Treatment 1 – control recorded lower available nitrogen in soil (274 kg ha\(^{-1}\)) as compared to rest of the treatments.

Available Phosphorus

The Treatment T10 recorded significantly higher available phosphorus in soil (22 Kg ha\(^{-1}\)) and closely related to T7 and T4. Treatment 1 – control recorded lower available phosphorus in soil (14 kg ha\(^{-1}\)) as compared to rest of the treatments.

Available potassium

The Treatment T10 recorded significantly higher available potassium in soil (210 Kg ha\(^{-1}\)) and closely related to T7 and T4. Treatment 1 – control recorded lower available potassium in soil (168 kg ha\(^{-1}\)) as compared to rest of the treatments.
Fig: 4.26. Available nitrogen, phosphorus and potassium Kg/ha content in soil after harvest of the crop.

Table: 4.27. Correlation of coefficients between pod yields, growth yield attributes as influenced by bio fertilizer and chemical fertilizer on French bean

<table>
<thead>
<tr>
<th>A. Pod yield with growth attributes</th>
<th>Number of branches</th>
<th>Number of leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant height</td>
<td>0.795</td>
<td>0.858</td>
</tr>
<tr>
<td>Number of branches</td>
<td></td>
<td>0.951</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Pod Yield with yield attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pods per plant</td>
</tr>
<tr>
<td>Pod yield per plant</td>
</tr>
</tbody>
</table>
The Karl Pearson correlation coefficient calculated among the different parameters of the French bean plant such as the height of the plant, number of branches produced & the number of leaves and the yield of the plant & the number of the plants grown. It has exhibited significant positive correlation among all the parameters, thus revealing the significant influence of the plant height and the number of branches and leaves grown as a healthy way of growth. The yield of the pods has revealed significant positive relationship with the number of pods per plant. These results clearly depict the well growth of the plant, which was influenced by the use of bio fertilizer and chemical fertilizer on the growth and yield attributes of French bean.
PHOTOGRAPHS
PHOTOGRAPHS
Photo shows preparation of land

Photo shows preparation of plot
Chapter 4

Experimental Results

Photo shows seed germination

Photo shows seed germination

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Chapter 4

Experimental Results

Photo shows early stage of plant growth of french bean

Photo shows growing stage of plant
Plot shows 10 days plants of french bean

Plot shows 20 days plants of french bean
Chapter 4

Experimental Results

Plot shows 20 days plants of french bean

Photo shows flowering stage of french bean
Chapter 4

Experimental Results

Photo shows harvesting stage of plant of french bean

Photo shows plant with crop at the stage of harvest of french bean
Chapter 4

Experimental Results

Data collection during the study

Data collection during the study
Chapter 4

Experimental Results

Photo shows that 20 days of soya bean plant

Data collection during the study

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Experimental Results

Photo shows flowering stage of soya bean plant

Photo shows flowering stage of soya bean plant
Chapter 4

Experimental Results

Photo shows 40 days growth of soya bean plants

Data collection during the study

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Experimental Results

Photo shows 60 days growth of soya bean plants

Photo shows the plant with crop at the stage of harvest
Photo shows crop yield of soya bean