CHAPTER VII

SUMMARY AND CONCLUSIONS
SUMMARY

Nitrogen is essential for plant growth as it is a constituent of all proteins and hence of protoplasm. There is a world wide shortage of nitrogen in food production. This shortage has an adverse effect on crop production and world food supply.

Indian soils are generally deficient in nitrogen and carbon. Various nitrogenous fertilisers and organic manures have been added to the soils to meet out the problem. The nitrogen added in the form of nitrogenous fertilisers is lost considerably by the soils and plants.

It is well known that addition of organic manures in the form of easily decomposable energy rich materials like straw, grass roots, molasses and crop residues fixes nitrogen as a result of the oxidation of organic manures in the soil.

When organic manures are used with phosphate and nitrogen, it shows a retarding effect on nitrogen loss from the fertilisers. Keeping in view the above and the local importance of oil cakes, particularly the ground nut and mustard nut oil cakes, they were chosen as a source of organic manure in the present investigations.
The main object of this investigation was to know whether mustard nut oil cake and ground nut oil cake when mixed alone in Sagar soil in the presence of ammonium persulphate, hippuric acid and uric acid and potassium chloride, dicalcium phosphate, enrich the soils and fix extra nitrogen from atmosphere through their oxidation in soil.

The thesis has been divided into seven chapters:

CHAPTER - I - deals with general introduction including literature survey. The objective and scope of the present study has also been discussed.

CHAPTER - II - consists of experimental methods as employed in the present investigations.

CHAPTER - III - gives an account of the collection of soil samples and their physical and chemical analysis.

CHAPTER - IV - consists of the investigations on loss of nitrogen with ammonium persulphate, hippuric acid and uric acid and retardation in nitrogen loss by mustard nut oil cake and ground nut oil cake and a mixture of these oil cakes along with potassium chloride or dicalcium phosphate. The main findings are:

1. When ammonium persulphate, hippuric acid and uric acid are added to soil, a loss of nitrogen occurs. Uric
acid suffers maximum loss and ammonium persulphate suffers the minimum loss.

2. The kinetics of nitrogen loss has also been studied. It has been found that with all the three nitrogenous substances ammonium persulphate, hippuric acid and uric acid, nitrogen loss follows first order kinetics. The specific reaction rates have been found to lie in the sequence (when nitrogenous substances alone are used).

Ammonium persulphate < hippuric acid < uric acid. Addition of organic matter, potassium and phosphorus causes lowering in the values of specific reaction rates in the following general order:

\[ N \succ N + C \succ N + C + K \succ N + C + K + P \]

where,

\begin{align*}
N &= \text{nitrogenous substances (ammonium persulphate, hippuric acid or uric acid)} \\
C &= \text{organic matter (ground nut oil cake and mustard nut oil cake)} \\
K &= \text{potassium or potassium chloride} \\
P &= \text{phosphate as dicalcium phosphate}
\end{align*}

3. Addition of organic matter in the form of ground nut and mustard nut oil cakes checks the loss of nitrogen.
Better results are obtained with mustard nut oil cake than with ground nut oil cake. Addition of potassium chloride further checks the loss and still better results are observed with a mixture of mustard nut oil cake/ground nut oil cake and dicalcium phosphate.

4. The loss of nitrogen is always more pronounced in sunlight than in dark.

5. Nitrogen fixation takes place with the expense of organic carbon.

CHAPTER V - deals with the effect of trace elements on nitrogen fixation, carbon transformations and Azotobacter populations in soils with mustard nut and ground nut oil cakes as organic matter. The main conditions are:

1. The trace elements molybdenum and zinc increase both the oxidation of mustard nut and ground nut oil cakes and efficiency of nitrogen fixation. The order of efficiency of trace elements in nitrogen fixation is: Molybdenum > Zinc.

2. Increasing the doses of molybdenum and zinc has little effect on oxidation of organic matter and nitrogen fixation.
3. Molybdenum increases the Azotobacter population more, zinc is less effective.

CHAPTER VI - describes the study of the effect of ammonium persulphate, hippuric acid and uric acid on the growth of tomato plants (Lycopersicum esculentum) when used alone and when mixed with mustard nut oil cake and ground nut oil cake in the presence of dicalcium phosphate. The results of pot experiments indicate that:

1. The incorporation of mustard nut oil cake improves the vegetative growth and fruit yield.

2. The addition of ammonium persulphate, hippuric acid and uric acid with organic matter (ground nut and mustard nut oil cakes), dicalcium phosphate and potassium chloride results in improved plant growth and yield of tomato plants and fruits.

3. The order of efficiency of these nitrogenous fertilisers has been found to be:

   Ammonium persulphate > hippuric acid > uric acid

4. In all combinations the presence of nitrogen either in inorganic or organic form with potassium chloride and dicalcium phosphate results in better growth of tomato plants.
This investigation shows that mixed fertilizers should be preferred to a single fertilizer with balance nutrient content and organic rich matters. The ground nut and mustard nut oil cakes, which are easily and economically available in Sagar and surrounding area, can be used profitably as potential organic rich manures for enhancing nitrogen fixation and retarding its loss.