CHAPTER 4

SUMMARY
The probable hazards that pesticides and their degradative products and other chemicals released into the environment can cause to man and other forms of life have necessitated detailed study of their behaviour, especially their non-target effects on soil fertility and soil enzymes. Since soil is the ultimate sink all the man made chemicals reach and accumulate in soil it-self affecting the soil microbial processes. Hence studies on non-target effects of these chemicals have become imperative. Further one must be also forewarned about the possible ways by which a compound once released and accumulated in the environment might affect life.

With some of these objectives in view, studies were conducted to know the impact of some nitroaromatic compounds (PNP, DNP, TNT and DNT) on soil mineralisation processes and some soil enzymes etc., Due to the importance of nitroaromatic compounds as the major pollutants from agricultural and industrial activities they were selected for the present study. The microbial activities selected under the present study included elemental transformations such as ammonification, nitrification, and activities of soil enzymes like amylase, invertase, dehydrogenase, phosphatase, protease and urease. The major observations of the study were summarized in this section.
1. Soil samples were treated with different concentrations of the four nitroaromatic compounds ranging from 10 to 100 ppm, supplemented with 1000 ppm nitrogen (N) in the form of analar grade peptone and maintained at 60% WHC. After 7 days of incubation the rate of ammonification was determined. Application of the nitroaromatics upto 50 ppm significantly increased the mineralization of peptone nitrogen. 25 ppm concentration alone was selected to study the impact of all nitroaromatic compounds on the rate of ammonification in all the three soils owing to the pronounced stimulatory effect of that concentration. Significant enhance in ammonification rate was observed upto 3 weeks with the application of all nitroaromatic compounds. During the fourth week of incubation ammonification process was further decreased.

2. To determine the impact of nitroaromatic compounds on nitrification, similar experiment was conducted as for ammonification except that soil samples were supplemented with 200 ppm nitrogen in the form of ammonium sulfate. Different concentrations of nitroaromatic compounds ranging from 10 to 100 ppm were applied to the soil samples and the rate of nitrification was observed after 2 weeks of incubation period. As for ammonification here
also 25 ppm concentration seems to be stimulatory to the oxidation of $\text{NO}_2^-$. The process of nitrification increased significantly up to 50 ppm level. When treated with 25 ppm concentration only, the rate of nitrification decreased after 8 weeks of incubation in all soils. Nitrophenols rather than nitrotoluenes appeared to be more toxic to nitrification rate.

Soil samples were treated with different concentrations of nitroaromatics ranging from 10 to 100 ppm and maintained at 60% WHC. After incubation for 10 days the activities of soil enzymes were determined by incubating the nitroaromatic treated soil samples further with the necessary substrates. The concentration which was found to be stimulatory to an enzyme activity was subsequently selected to determine the rate of enzyme activity at different incubation periods.

3. During 10 days incubation the activity of amylase in terms of glucose formed from starch was significantly more in soil samples treated with 25 ppm concentration of the nitroaromatic compounds. At higher concentrations the nitroaromatic compounds suppressed amylase activity. During 20 days of incubation amylase activity was significantly more. By increasing the incubation period
(up to 30 and 40 days) amylase activity progressively decreased. In general nitrophenols exhibited more stimulatory effect than nitrotolunes after their treatment.

4. Invertase activity also showed significant stimulation at 25 ppm concentration with all nitroaromatic compounds. As with amylase during 20 days of incubation, invertase activity also showed significant stimulation.

5. Dehydrogenase activity measured in terms of triphenyl formazan (TPF) formed from triphenyl tetrazolium chloride (TTC) showed significant increase in soil samples treated with 25 ppm of all nitroaromatic compounds. A striking stimulation in dehydrogenase activity was observed in soil samples incubated for 20 days after the treatment of nitroaromatic compounds and further increase in incubation period resulted decrease of dehydrogenase activity.

6. Activities of phosphatase and protease also exhibited a pronounced rate of stimulation at 25 ppm of all nitroaromatic compounds in soil no.1. On treatment of all soils with 25 ppm a striking increase in phosphatase and protease activities observed only upto 20 days of incubation and further increase in incubation period (30
and 40 days) significantly decreased the activities of both phosphatase and protease.

7. Soil urease activity was significantly enhanced up to 50 ppm level in soil no.1 with striking activity at 25 ppm. At 75 and 100 ppm levels significant inhibition resulted. The urease activity was increased up to 30 days of incubation in all soils at 25 ppm levels of all nitroaromatic compounds. By the end of 40 days of incubation urease activity was significantly suppressed.

To conclude, the results of present study indicate that nitroaromatic compounds (PNP, DNP, TNT and DNT) which are the major degradative products from agricultural and industrial activities, at lower levels (25 ppm) may activate the soil mineralisation processes and some soil enzymes and toxic at higher levels (75 and 100 ppm). Henceforth measures has to be initiated to check the accumulation of these nitroaromatic compounds in soils and to protect the fertility of crop fields for future generation.