DISCUSSION
Biochemical studies (Quantitative estimations) form an important part of investigation in animals specially when it is in relation to the effect of various drugs or different pollutants. There are practically such studies on the rats blood available are negligible in relation to pesticides which from a hazardous group of chemicals in the environment affecting non-target species. Studies on rats blood however, have revealed significant changes in the total serum protein on exposure to pesticide.

In the present study after the oral administration of sublethal dose of Dimecron and Raflodrin and intramuscular injection of Propoxure for short term (24, 48, 72 and 96 hours) and long term (91 days) caused a significant increase in total serum protein with all the three pesticides and also with acute and chronic exposure.

Rajanna et al. (1981) studied the effect of cadmium chloride on the total serum protein in rats found significantly increased values. But Qayyum et al. (1982) reported a decrease in total serum protein in rabbit due to lead nitrate intoxication. According to them this decrease was due to the retarded synthesis of proteins Kumar (1990) also observed a decrease in total serum
protein in rats blood due to the effect of molybdenum. According to him this decrease may be either due to the renal excretion (albuminuria) or due to liver disorder as also reported by Rana and Kuma (1983).

As the literature shows only few workers have studied the effects of pesticides. Deshmukh et al. (1990) observed the initial little decrease after 3 hours but later a significant increase after 6 and 24 hours of hailed intoxication in rat's blood. Dikshit et al. (1991) studied the effect of HCH and methyl parathion on the total serum protein in the blood of Rattus norviegicus and noted an increase in both the pesticides as well as with the combination of these pesticides. But Agarwal et al. (1992) observed a significant decrease in total serum protein after the exposure of phorate in the blood of female albino rats except in those animals received phorate orally. This decrease in serum proteins might be due to gluconeogenesis as shown by increased blood glucose level for both periods of treatment. Agarwal et al. (1991) have already reported the same observations in their study on phorate administered rats similarly hyperglycaemia associated with decreased plasma proteins has been observed in buffalo when they were fed with
malathion sprayed fodder and the explanation has been made on the basis of release of epinephrine from the adrenal medulla and acceleration of gluconeogenesis (Gupta and Paul 1977). Sarkar et al. (1993) observed the increased values of total serum protein in rats after the administration of isoproturon of for 7 days. Jeevaratnam (1993) also reported an increase in total serum proteins in rats after the subcutaneous administration of methyl isocyanate or inhalation of the same. Both produced dose related significant haemoconcentration i.e. increased plasma proteins.

It could be possible that pesticides enhanced the protein metabolism protein, special serum albumin have a large role in pesticide transport by blood (Skaloky and Guthrie 1978). Total protein contents recorded elevations in values and may possibly due to increased absorption of protein through intestine or increased synthesis of proteins related to antibodies. Above findings indicate the toxic thus changing haemogram and the biochemical parameters and attention suggest indirect effect on erythropoietic organs liver and kidney also (Kurde 1993 congo red induced albino rat).
This increase in total serum protein may be associated with the decrease in glucose. This increase in total serum protein may be due to the pesticidal effect on liver resulting in its enlargement without affecting the body weight of the rats. The enlargement of liver may be due to the marked increased synthesis of hepatic microsomal enzyme protein in the treated rats, as also reported in literature due to isoproturon (Sarkar and Gupta 1993). This may be due to the toxic effects of pesticides.

The increase in total protein may also be explained as the pesticides retards process of gluconeogenesis and the release of epinephrine from the adrenal medulla. It could also be possible that pesticides enhanced the protein metabolism.

On reviewing the literature it is observed that some of the scientists have made their studies on the effects of different chemicals like heavy metals, plants extracts, drugs pesticides and some other chemicals etc. on the blood glucose of different mammals and have reported increase or decrease in blood glucose levels. In the present studies the blood glucose level has been found significantly lower in all the cases of short term
(96 hours) and long term (91 days) intoxication of Dimecron, Tadfrin and Propoxur.

Some scientists have studied the effect of some plant extracts on the blood glucose and majority have reported a decrease in the glucose level. Gupta (1985) reported decrease in glucose level in rat due to *Malva viscosa* and *Hibiscus rosa-sinensis*. Jha (1986) and Sivaswamy (1990) also observed decrease in glucose level in the blood of rat after the administration of *Terminalia arjuna* and *Sapindus trifoliatus* and Tannins (from higher plants). But Mehta (1989) reported a decrease in extract Datura seed administered rats blood and increase in Datura metal administered rats (1992). Some of the workers have studied the effect of different drugs also Santhoshkumari (1991) reported a decrease in blood glucose level in rabbits treated with two of the ayurvedic drugs Nisakathakathi Kashayam (NK) and Rasnairandadi Kashayam (RK) decreased in glucose level was also found in Alloxan administered rats by Bhattacharya (1991). But Joshi (1991) observed an increase in the values after the administration with streptozotocin. Shoka (1992) reported an increase in Phenformin and Gilbenclamide treated rats and decrease in EDTA treated rats.
Rajanna (1981), Llobet (1988) and Kumar (1990) studied the effect of heavy metals like cadmium chloride. Zinc and molybdenum and reported respectively an increase, decrease and increase in blood glucose level of rats.

Qayyum (1982) observed a decrease in the level in rabbit after the administration of lead nitrate. Singh (1977), Verma (1991) and Saxena (1991) cls studied this parameter in dog and rats under the exposure of Angiotensin II, I.DPH-791 and swerchirin like toxicants and reported a decrease in the levels, but Bilgrami (1987) observed an increase in citrinin administered mice.

As the literature available shows very few scientists have paid attention to study the effects of different pesticides on this important parameter known. "the sugar of life". Honnegowda (1983) studied this important parameter of blood in malathion administered rats and found that the values were increased upto 4 days of pesticide administration, but the change in values was not significant. In 8 days pesticide administered rats the glucose level was observed decreased but this decrease was also not significant. After 15 days of malathion administration the values were again
found increased, touching the values of control (63.40 mg/dl in control and 63.50 mg/dl in experimental). Some author (1984) again studied the effect of malathion and reported significant hyperglycaemic effect in sham operated male rats (Control 76.1 mg/dl, experimental 141.8 mg/100 ml). A decrease was observed in adrenalectomised female rats (Control 70.5 mg/100 ml, 66.4 mg/100 ml). This indicates the involvement of adrenal glands in hyperglycemic effect caused by malathion. Hussain (1986) also studied the effect of malathion on this important parameter in rats and also found an increase in the glucose level. But Agrawal (1987 and 1992) studied the effect of other pesticides of different nature, Lindane and HCH and observed a significant decrease in the blood glucose levels in the pesticide administered cats and rats. Blood glucose levels were altered in both short and long term intoxication (Silvia et al. 1978 and Agrawal et al. 1987).

A reduction in blood glucose level could be contributed by multiple factors and may be due to defective glycogenolysis or glyconeogenesis and impaired hepatic glucose release. (Agrawal et al. 1992). Barros and saliba (1978) also reported similar results in rats after BHC (900 ppm indiet)
exposure for 90 days. A reduction in blood glucose level has been observed in experimental animals by lindan (Y-HCH) exposure also (Agrawal et al. 1987).

Ahmad (1989) exposed the rats to synthetic pyrethroid insecticide the cypermethrin for 13 weeks with three different doses and observed a decrease in lowest (6.6 mg/kg/day) and highest (33.3 mg/kg/day) pesticide concentration and a slight increase in middle (14.8 mg/kg/day) concentration. The change in values with highest concentration was found to be significant.

Few workers like Desmukh (1990), Nadia (1980), Aggrawal (1992) and Sarkar (1993) reported an increase in glucose mg/dl in Naled, Phorate, Sevin lindane and Isoproturon treated rats but Das (1992) reported a decrease in HuVan administered mice.

It was observed that malathion Naled, phorate, sevin, lindane and Isoproturon pesticides caused an increase in blood glucose level indicating hyperglycemic condition. While cypermethrin, Lindane, malathion (in female rats) and Nuvan caused a decrease indicating the hypoglycemic condition. In the present study Dimecron, Tafdrin and
Propoxure, all the three pesticides of three different nature caused a decrease in glucose level in both sexes after acute and chronic exposures (i.e. for 96 hours and 91 days respectively).

A reduction in glucose level in blood as observed in the present study could be contributed by multiple factors and may be due to defective glycogenolysis or gluconeogenesis and impaired hepatic glucose release as also explained by Barros and Saliba (1978). Who reported change in glucose levels of blood in rat after BHC exposure. It may also be possible that due to pesticide stress and their toxic effects the pancreas the pancreas gets stimulated and excessive amounts of insulin are secreted, resultant is the decreased level of blood glucose. The excessive utilisation of glucose may also be the reason for decrease in glucose level. It is suggested to investigate the exact reason of this decrease in glucose level in the blood of pesticide administered rats.

On reviewing the literature it was observed that except Soni and Bhatnagar no work is available on the quantitative estimation of serum cholesterol in pesticides intoxicated mammals. In the present study serum cholesterol was estimated quantitatively in all the three pesticides i.e. Dimecron, Tafdrin
and Propoxur administered rats of both sexes. Sexwise no marked changes were observed in experimental rats. The rats of both sexes exposed to Dimecron, Tafdrin and Propoxur for 96 hour and 91 days recorded an anintial significant decrease and than a continous increase upto the end of the experiment. At the end of the experiment the values of serum cholesterol were found increased. Which were very close to the values of control rats or we can say that the values were almost same to the values of control rats.

Soni and Bhatnagar studied the serum cholesterol in phosphamidon treated swiss albino mice and reported an increase in the cholesterol level. It is quite likely that the phosphamidon treatment results in a decreased rate of concersion of cholesterol into bile acids. Increased in serum cholesterol has been reported in workers occupationally exposed to organochlorine insecticides (Wassermann et al. 1958) and in the fish puntius conchonius, exposed to organochlorine insecticide and carbamate pesticides (Pant and Singh 1983). Some other workers have tried to study the effect of some heavy metals on the serum cholesterol of mammals. Qayyum et al. (1982) studied the effect of lead nitrate and reported a decrease in the serum
cholesterol values in rabbits. They reported the decreased values in lable (control 34.00 mg/dl) and 12th dose - 30.00 mg/dl) but in discussion they have reported that the increase in the cholesterol level might be due to the impaired synthesis of hepatic lipoproteins due to lead administration. Mathur et al. (1989) reported an increase in serum cholesterol values in the Beryllium sylphate administered mice. Kumar (1990) also reported increased values of serum cholesterol in molybdenum treated rats. The elevated blood cholesterol level may be due to hypermetabolic state or as a result of impaired liver function as pointed out by Curran (1954).

Gupta et al. (1985) studied the effect of Malva viscous and Hibiscus rosa sinensis and reported decrease in serum cholesterol values in M. viscous treated rats and increase in H. rosa sinensis treated rats. Jha and Dixit (1986) reported that serum cholesterol was found reduced after T. arjuna (P<0.01) and S. trifoliatus (P<0.01) treatment.

Santhoskumari and Devi (1991) was reported decreased values of serum cholesterol in rabbits after the treatment of two ayurvedic drugs Nisakathakathi Kashayam (NK) and Rasnairandadi Kashayam (RK).
It was observed that no worker have described the reasoning for the decreased values of serum cholesterol observed in different experiments. Here in the present studies the serum cholesterol values found first decreased in short and long term exposure of Dimecron, Tafdrin and Propoxur and afterwards found gradually increased and ultimately at the end of the experiment the values of experiment rats reached to the values of control.

This initial decrease may be due to the decline in the synthesis rate of cholesterol or increase in the excretion rate of cholesterol from body through skin. Sebaceous glands faeces and urin. This may be due to the stress caused by the toxic effects of pesticides or pesticides have effected the factors that put cholesterol into the blood and the factors that take it out resulting under supply or over removal of cholesterol from the blood or in otherwords due to increased rate.

The cholesterol is utilised as a precursor in androgen biosynthesis. In rats the liver is responsible for most cholesterol synthesis. Bile acids rather than cholesterol, inhibit cholesterol synthesis increased rate of turn over and excretion (Martin et al., 1985). The cholesterol values also observed decreased in case of chronic anaemic
conditions and same is observed here also due to the toxic effects of pesticides.

The secondary gradual increase in the serum cholesterol values observed here in pesticide administered rats can be explained as due to pesticide administration in later stages a decrease in rate of conversion of cholesterol into bile acids (Soni and Bhatanagar) or may be due to the impaired synthesis of hepatic lipoproteins due to pesticide administration. (Qayyum 1982) or due to hypermetabolic state or as a result of impaired liver function as pointed out (Curran 1954).