RESULTS

Composition of Eucalyptus seed meal:

Data on the chemical composition of Eucalyptus seed meal (CEM) and processed Eucalyptus seed meal (PEM) and their amino acid profile are presented in table 1. Analysis of CEM indicates that it contains approximately 54.9 g carbohydrates, 10.0 g moisture, 6.4 g tannins, 6.2 g ash, 14.6 g protein, 2.1 g crude fat, 4.5 g crude fibre and 1.3 g saponins/100 g. PEM was also analysed and having the following composition (g/100 g): carbohydrates 56.9, protein 15.6, moisture 8.0, ash 6.0, crude fat 2.1, crude fibre 4.2 and saponins 0.4. Tannin content of PEM was approximately at the same level as that of CEM when analysed following the AOAC (1970) colourimetric method. But the egg albumin precipitation test revealed that PEM tannins lost the ability to precipitate egg albumin solution. This shows that PEM-tannins were detoxified and no longer had the capacity to complex protein.

The amino acid profile of CEM and PEM suggests that they contain 17 amino acids including 10 essential amino acids. Amino acids methionine and cystine are very much low both in CEM and PEM while arginine and glutamic acid are exceptionally high. There appears to be some indication that during processing of the seed meal under the experimental conditions, a certain loss of the sulphur containing amino acids is taking place together with some other amino acids.
Comparative study of the protein content of Eucalyptus seed meal:

Protein content of Eucalyptus seed meal in different standard methods are shown in table 2. The method in which only water was used to extract protein, the protein content varied from 80 to 85 g/kg; when 1 M sodium chloride solution was used as solvent, the protein content varied in the range of 102-105 g/kg. Addition of 5% sodium carbonate solution to 1 M sodium chloride solution improved the result and the protein isolated at a level of 115 - 118 g/kg. Protein obtained at a level of 135 - 142.3 g/kg seed meal, in the method, in which sodium hydroxide solution (pH 12) was used as extracting solution and then precipitated by adding 10% TCA solution. Nitrogen content of the proteins obtained in various methods are also varied in the range of 10.8 to 14.2%. Proteins are completely soluble in aqueous caustic soda solution at pH 8.3. Moisture, ash, tannins, saponins and non-proteinous materials of the isolated proteins in different methods are also noted.

Composition of Eucalyptus seed protein isolate:

Table 3 summarized the results obtained for moisture, total ash, total nitrogen and amino acid profile of the protein isolate obtained from PEM. The seed protein isolate contains 17 amino acids including 10 essential amino acids. It is evident from the amino acid profile that the amount of methionine and cystine are low whereas arginine is exceptionally high. The remaining essential amino acids were also present at levels that were
somewhat lower than those present in the standard vegetable or plant proteins.

Gel electrophoresis of Eucalyptus seed protein:

Gel electrophoresis pattern of Eucalyptus seed protein isolate shows four distinct bands (figure 1) named as EOP$_3$, EOP$_2$, EOP$_1$ and EglyP (from top to bottom). The band marked for EglyP was localised with periodic acid-schiff (PAS) test, which gave a majenta colour indicative of positive reaction of glycoprotein. The mobilities of the protein fractions were calculated. The calculated mobilities for the protein fractions were: EOP$_3$ 0.08, EOP$_2$ 0.24, EOP$_1$ 0.38 and EglyP 0.65. The mobilities of the standards were: 11 S fraction of sunflower protein 0.06, pyruvate kinase 0.24, aldolase 0.42 and serum albumin 0.63. Molecular weights of the standard samples were plotted against their mobilities and is shown in figure 2. From the graph the molecular weights calculated for protein fractions were: EOP$_3$ 295,000, EOP$_2$ 240,000, EOP$_1$ 170,000 and EglyP 65,000.

Paper electrophoresis:

Paper electrophoresis of Eucalyptus seed protein isolate was also done which shown four distinct bands for four protein fractions.

Sephadex G-150 filtration:

Chromatographic pattern of sephadex G-150 filtration of Eucalyptus seed protein isolate is shown in figure 3. The distribution of
protein fractions as percentage of the total recovered protein was: peak I (EOP_3), 39% (fractions 26-62); peak II (EOP_2), 13% (fractions 68-88); peak III (EOP_1) 35% (fractions 94-130); peak IV (EglyP), 13% (fractions 136-160). The peak fractions were collected and freeze dried or protein in it was precipitated with 40% ammonium sulphate (W/V). The peak fractions IV gave characteristic glycoprotein-positive reactions. A plot of log molecular weights against \( V_e - V_o \) of the standard samples is shown in figure 4. From the graph, the molecular weights calculated for EOP_3, EOP_2, EOP_1 and EglyP were 295,000, 240,000, 170,000 and 65,000 respectively.

Amino acid profile of protein fractions:

Amino acid composition of EOP_3, EOP_2, EOP_1 and that of glycoprotein, EglyP before and after alkaline borohydride treatment is given in table 5. The results revealed that the amino acid profile of the protein fractions were almost similar to that of seed protein itself. Protein fractions EOP_3, EOP_2, and EOP_1 contain 17 amino acids including 10 essential amino acids. Amino acid composition of EglyP is completely different from that of other protein fractions and seed protein isolate. The amino acids serine and threonine were the major components associated with glycine, alanine, valine, tyrosine and aspartic acid as minors. It is in this context that EglyP after treatment with alkaline borohydride treatment resulted in the loss of threonine and serine.
Carbohydrate composition of EglyP:

Total carbohydrate contents of the glycoprotein fraction (EglyP) was approximately 34-35%. The glycoprotein gave four types of monosaccharides, one type of disaccharide and one type of trisaccharide, which is shown in table 6. Monosaccharides obtained were glucose, mannose, mannitol and glucose. Disaccharide on acid hydrolysis gave mannose and mannitol and trisaccharide on acid hydrolysis gave glucosamine, mannose and xylose.

Heat denaturation:

Heating the protein fractions and seed protein itself in 0.025 M trisglycine buffer of pH 8.3 in the range of 30-90°C did not precipitate the protein, only turbidity developed which increased with increase in temperature. The turbidity was expressed as \((T_0 - T)/T_0 \times 100\), is plotted against the temperature of heating and is shown in figure 5. It was observed that the turbidity of protein fractions at various temperature differed from one another and also that of seed protein itself. Generally, upto 70°C, there was no turbidity for protein fractions EOP₂, EOP₁ and EglyP but above that temperature the turbidity increased sharply and reached a value in the range of 90-100 at 90°C.

Solution of protein fractions, EOP₃ and seed protein itself developed turbidity on 60°C and above that temperature of heating, turbidity increased sharply with a value of nearly 100 at 90°C. The effect of time variation of heating on turbidity was also determined which shows that heating for 5 minutes did not developed turbidity at any temperature and heating for more
than 10 minutes did not increase the turbidity value \((T_0 - T)/T_0 \times 100\).

Feeding Experiment No. 1:

In this feeding experiment Eucalyptus seed meal (CEM) and processed Eucalyptus seed meal (PEM) were nutritionally evaluated and comparison was made with casein. The results of this feeding experiment are summarised below.

Body weight gain, CP intake, PER, TD, BV and NPU of CEM and PEM and casein supplemented diets and different levels of amino acid supplemented diets to rats are shown in table 8. The results recorded with feeding trials with rats show that at a level of inclusion of CEM in the diet of 300 g/kg, the PER and NPU values were 1.49 and 0.29 compared with those recorded for PEM in the diet (PER, 2.25; NPU, 0.48) and casein (PER, 2.77; NPU, 0.80). Supplementation of essential amino acids to PEM diet elicited a growth response. The addition of DL-methionine and DL-cystine at 4 g and 8 g/kg diet improved growth, PER, BV and NPU. Supplementation of amino acids to PEM diet raised the BV value to 0.80 from 0.56 for unsupplemented. According the value of PER of unsupplemented PEM was improved by 13.8% by supplement No A, 29.3% by supplement No B and 30.2% by supplement No C. Body weight gain was also improved by 16%, 34% and 40% by supplement Nos A, B and C respectively.
Values for the haematological and biochemical parameters are given in table 9. The results revealed that blood Hb and certain values for blood biochemical parameters of rats fed on CEM-supplemented diet were significantly differed from those of fed casein diet. Blood sugar, serum total lipids and serum cholesterol levels were exceptionally high while blood Hb, serum total protein and serum albumin levels were significantly low in the rats fed on CEM-supplemented diet. The animals fed on PEM or casein-supplemented diets did not differ with regard to a variety of parameters such as blood Hb, blood urea and total protein, total lipids, phospholipids and cholesterol contents of serum. Only a significantly ($\alpha 0.05$) higher blood sugar level was observed in the rats fed on PEM-supplemented diet but the value recorded was still within the normal range of variation.

Protein, nucleic acid and lipid composition of liver of rats fed diets containing CEM, PEM and casein are presented in table 10. It is evident from the results that intake of PEM-supplemented diet did not produce any significant alteration in the concentration of total protein, nucleic acids and lipid composition either at the level of whole liver or liver microsomes while intake of CEM-supplemented diet caused a significant reduction in the concentration of total protein and RNA and significant increase in the concentration of total lipid and cholesterol. A significant increase in total lipids of liver and cholesterol of liver microsome was observed in the rats given PEM-supplemented diet, but the increased values were still in the range of normal biological limit.
Alanine aminotransferase, aspartate aminotransferase and alkaline phosphatase activities of serum and liver are shown in table 11. From the results it appears that intake of CEM-supplemented diet caused a significant increase in the activities of aminotransferases both in serum and liver. Intake of CEM-supplemented diet appeared to have no significant effect on serum or liver alkaline phosphatase activity under similar condition but the values were slightly higher than normal controls. No significant alteration in the activities of aminotransferases or alkaline phosphatase of serum or liver was observed in the rats fed on PEM-supplemented diet.

The liver sections from all the rats fed the diet containing CEM showed several histopathological abnormalities. A mild to moderate degree of fatty infiltration and necrosis were seen in the liver sections of rats fed CEM diet. All other organs were normal. Histopathological examination did not reveal any significant abnormalities in the rats fed PEM or casein-supplemented diets.

Feeding Experiment No. 2:

In this feeding experiment, protein isolate obtained from processed Eucalyptus seed meal was nutritionally evaluated and the results were compared with those of casein and soybean protein.

Values for the CP intake, body weight gain, PER, TD, BV and NPU are given in table 13. The results revealed that there
is no significant differences in CP intake between different dietary protein groups except amino acid supplemented diets in which extra N comes from the added amino acids. With Eucalyptus seed protein used in the present study, growth in rats was 85% of that with the casein diet and 96% of that with soybean protein diet. The addition of essential amino acids progressively improved the body weight gain to a maximum of 102% (supplement No. F) of that with casein diet. Eucalyptus seed protein used in the diet, the PER and NPU values were 2.11 and 0.42 compared to those of soybean protein (PER 2.21, NPU 0.47) and casein (PER 2.77, NPU 0.80). The addition of essential amino acids improved PER, BV and NPU. Accordingly the value of PER of unsupplemented Eucalyptus seed protein was improved by 11% by supplement D, 20% by supplement E and 21% by supplement F. Supplementation of Eucalyptus seed protein diet with essential amino acids raised the NPU value to 0.53 (supplement F) and BV value to 0.58 (supplement F).

Values for the blood biochemical parameters are shown in table 14. In this study, blood Hb contents of all the experimental animals varied 15.4 to 15.6 g/100 ml blood, which were thus within the normal range of variation. Different protein dietary groups did not differ significantly with regard to a variety of parameters such as blood urea, serum total protein, serum total lipids and serum phospholipids. A significantly higher blood sugar level was observed in the rats given Eucalyptus seed protein supplemented diet as compared to those
of casein controls. Intake of soybean protein or Eucalyptus seed protein-supplemented diets caused a significant reduction in the concentration of serum cholesterol.

Table 15 summarized the results obtained for liver weight, protein, nucleic acids, glycogen and lipid composition of liver and liver microsomes. The animals fed different protein supplemented diets did not differ significantly with regard to a variety of parameters such as liver weight, total protein, nucleic acids and glycogen either at the level of whole liver or liver microsomes. The results revealed that dietary proteins caused significant alteration in the liver lipid composition. Intake of soybean protein and Eucalyptus seed protein caused a significant reduction in the concentration of total lipid and cholesterol of liver and liver microsome when compared with the casein fed controls. Phospholipids of liver and liver microsomal fraction of rats fed diets containing soybean protein and Eucalyptus seed protein showed a decline from control value but the changes were non-significant.

Table 16 gives the results of transaminases and alkaline phosphatase activities of serum and liver. The results revealed that the enzymatic activities did not differ significantly between different dietary protein groups and all the values were normal.

The histopathological findings also did not reveal any significant differences in the organs from the rats fed different protein diets.
Results

Analytical composition and amino acid profile of Karanja seed meal (RKM), processed Karanja seed meal (PKM) and PKM-protein isolate are presented in table 17. The RKM contains approximately 94.5% dry matter (DM) and 33.2% CP but it contains 0.35% and 4.1% karanjin and saponins respectively while PKM provided 95.1% DM and 32.0% CP but karanjin and saponins were detoxified in it. CP content of PKM is somewhat less than that of RKM. Probably this loss occurs during processing. Protein isolated from the PKM was white in colour and provides 19.2 MJ/kg energy. The seed protein isolate contains essentially no antinutritional factors.

The amino acid composition suggests that RKM, PKM and the seed protein isolate contain 16 amino acids including 10 essential amino acids.

Feeding Experiment No. 3:

In this study, feeding trials of Karanja seed meals (both raw and processed) and PKM-protein isolate were performed in rats. Nutritional and metabolic informations regarding this feeding experiment are given below.

Values for body weight gain, CP intake, PER, TD, BV and NPU are shown in table 19. The results indicate that growth of rats fed RKM diet was about 38.3% of that with casein diet while PKM diet improved the growth to 85.2% of casein diet. Growth performance of PKM-protein isolate was poor as compared
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to that of PKM and it was about 60.8% of that with casein diet. It is evident from the results that the lowest BV and NPU values were recorded for RKM (BV 0.40 and NPU 0.28). Seed protein isolate also showed poor values for BV and NPU. Supplementation with essential amino acids to PKM diet practically had no effect on growth or PER, BV or NPU while addition of essential amino acids to PKM-protein isolate diet progressively improved growth, PER, BV and NPU. The addition of essential amino acids to seed protein isolate diet increased PER value to a maximum of 46% (supplement No. J) of that with unsupplemented.

Haematological and biochemical parameters of serum and liver are presented in table 20. RKM diet caused a reduction in the level of blood Hb, blood sugar, blood urea and serum protein when compared with the casein fed controls. Intake of PKM diet produced a lower level of blood sugar, serum total lipids and serum cholesterol. Seed protein isolate supplemented diet also reduced serum total lipid level including cholesterol. A significantly lower level of total protein and phospholipid was also observed in the rats fed on RKM-supplemented diet at the level of whole liver.

Aminotransferases and alkaline phosphatase activities are shown in table 21. The results revealed that PKM and seed protein isolate have no adverse effect on the enzymatic activities and the values were almost similar to that seen with the casein diet. Intake of RKM-supplemented diet significantly elevated both aminotransferases and alkaline phosphatase activities.
Results

Several significant histopathological abnormalities such as distorted architecture, fatty infiltration etc. were seen in the sections of liver and kidney of rats fed RKM-supplemented diet. No significant histological abnormalities were seen in any organ of rats fed PKM-supplemented diet.

Feeding Experiment No. 4:

In this study, feeding trials of processed Akashmoni seed meal (ASM) and its protein isolate were conducted with albino rats to assess their safety for edible use. Nutritional and metabolic status of these were biologically tested and compared with that of casein and the results of this feeding experiment are given below.

Analytical composition and amino acid profile of the ASM and ASM-protein isolate is shown in table 23. Analysis of ASM indicates that it provides approximately 91% DM and 40% Cp. ASM contains tannins at the same level as that of crude seed meal (5.1%) but in inactivated form. Crude fibre content of ASM is also low. The total energy determined in adiabatic bomb calorimeter, for ASM it was found to be 18.4 MJ/kg while it was 19.8 MJ/kg for that of ASM-protein isolate.

Amino acid profile of ASM and its protein isolate suggest that both of they contain 17 amino acids including 10 essential amino acids. Amino acids methionine and cystine are present at low levels while leucine, an essential amino acid is present at high level.
Results

Values for CP intake, body weight gain, PER, TD, BV and NPU are summarized in table 24. It is found that there was no differences in CP intake between different groups. Regarding body weight gain, it is found that intake of ASM caused a weight gain which was approximately 70% of that with casein diet while intake of ASM-protein isolate-supplemented diet, growth in rats was 60% of that with the casein diet. Addition of essential amino acids to ASM and ASM-protein isolate diets progressively improved body weight gain and it was found to be a maximum of 95.6% of that with casein diet for ASM (supplement M) and 93.4% for ASM-protein isolate (supplement P). The value for PER was also improved due to supplementation of amino acids. Unsupplemented ASM showed the value for PER 1.96, which raised to 2.54 (supplement M) and for ASM-protein isolate the PER value increased to 2.45 (supplement P). BV and NPU values were also increased due to addition of essential amino acids to seed meal or seed protein isolate supplemented diets. Addition of essential amino acids to ASM and ASM-protein isolate diets, NPU values were increased to maximum of 21% and 20% respectively of that with their corresponding unsupplemented diets.

Values for the blood and liver biochemical parameters are shown in table 25. Blood Hb level varied in the range of 15.4 to 15.8 g/100 ml, were thus within the normal range of variation. Intake of ASM caused a significant (<0.001) lower blood sugar level as compared to that of casein. Intake of ASM-
protein isolate diet for 30 days resulted reduction in the concentration of serum total lipids including serum cholesterol. Total liver lipids were also reduced in the rats fed ASM-protein isolate diet. The experimental animals of different groups did not differ significantly with regard to a variety of blood and liver biochemical parameters such as blood urea and total protein, phospholipids and FFA of serum and liver.

Alanine and aspartate aminotransferases and alkaline phosphatase activities of serum and liver are given in table 25. Results revealed that ASM and ASM-protein isolate had no adverse effect on these enzymatic activities. The enzymatic activities of both serum and liver were almost similar to that seen with casein diet.

Histopathological findings also did not reveal any significant abnormalities in the organs from the rats fed either ASM or ASM-protein isolate supplemented diets.

Essential amino acid pattern:

Recommended essential amino acid pattern of FAO/WHO (1973) and essential amino acid composition of CEM, PEM, PEM-protein isolate, ASM and ASM-protein isolate are given in table 27. The amino acid profile suggest that amino acids methionine and cystine are the first limiting in all these seed meals and seed protein isolates. The remaining essential amino acids were also present at levels that were somewhat lower than those recommended in the FAO/WHO pattern. It is interesting to note that some essential
amino acids contents of the seed protein isolate are lower than that of corresponding seed meal. It is evident from the results that the methionine-cystine content of ASM-protein isolate is about half of the value recorded for ASM and that value for PEM-protein isolate is about two-third of the PEM.

Essential amino acid pattern of FAO/WHO (1973) and the amount of each essential amino acid provided by RKM, PKM and PKM-protein isolate are recorded in table 28. PKM contains isoleucine and threonine at levels that were somewhat lower than those recommended by FAO/WHO. Seed protein isolate is not only deficient in isoleucine and threonine but also in methionine-cystine and valine.

Comparison of the essential amino acid pattern of casein (CS), and soybean protein (Promine-D) and those of PEM, PKM, ASM and seed protein isolates i.e. PEM-protein isolate (ESP), PKM-protein isolate (KSP) and ASM-protein isolate (ASP) are shown in table 29. The results revealed that PEM, ASM and all seed protein isolates contain methionine-cystine at level that was somewhat lower than that of present in casein. Arginine is exceptionally high in all the seed meals and seed protein isolates as compared to that of casein. When the values of essential amino acids were expressed as essential amino acid content : N content, the value for ASM (3.47) is higher than that of casein (3.28) but all other values for promine-D (2.68), PEM (2.48), PKM (3.12), ESP (2.32), KSP (2.34) and ASP (3.25) are lower than that of casein (3.28).
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Feeding Experiment No. 5:
In this feeding experiment biological testings of refined and hydrogenated Eucalyptus oil (RHEO) and refined and hydrogenated Karanja oil (RHKO) were performed with growing albino rats. Coconut oil and corn oil were used for comparison. A normal diet with mixture of fatty acids was also used for comparison. The results of this feeding experiment are summarized below.

Physicochemical characteristics and fatty acid composition of RHEO and RHKO used in the diets as determined by GLC are shown in table 31. The unsaponifiable matter content of both RHEO and RHKO are very low and at a level of 0.9 and 0.5 per cent respectively. Acid value are also very low i.e. for RHEO it was 0.4% while 0.8% for RHKO. Both RHEO and RHKO contains low amounts of essential fatty acids i.e. linoleic acid while contains high amounts of oleic acid. The fatty acid profile is similar to that of saturated fats or oils like coconut oil in that, they contain high amounts of saturated fats and low amount of linoleic acid. Except the usual fatty acids RHKO contains a low amounts of behenic acid, lignoceric acid and arachidic acid and RHEO contains some lower chain fatty acid (14:0) and arachidic acid. RHEO contains 10% isomeric fatty acids while RHKO contains 30%. There were no toxic oxygenated fatty acids such as epoxy, keto or hydroxy acids in RHEO or RHKO as revealed by GLC. Toxic non-glyceride components have not been found either in RHEO or RHKO by chemical analysis.
Table 32 summarized the results obtained for food intakes, feed efficiency ratios (FER), body weight gain, blood Hb, blood sugar, blood urea and serum total protein of rats fed normal, coconut oil, corn oil, RHEO and RHKO supplemented diets. There were no significant differences in food intake between different groups. In general weight gain was greater in rats given different fat-supplemented diets over normal controls but the differences were non-significant. Different groups did not differ with regard to haematological and certain biochemical parameters such as blood Hb, blood sugar, blood urea and serum total protein.

Effect of different dietary fats on the concentration of plasma and liver lipid composition are given in table 33. Total lipid content of plasma and liver significantly increased in the rats given fat-supplemented diets. FFA levels of plasma also rose significantly in the rats on fat diet as compared to that of controls. Serum cholesterol levels were elevated in the rats fed coconut oil or RHEO diets while reduced in the rats given corn oil or RHKO diet. Values for other lipid composition remained almost unaltered in between different fat dietary groups or normal controls.

The fatty acid composition of plasma from rats fed on diets supplemented with different fats or a normal diet are given in table 34. The results revealed that the fatty acid composition of plasma was modified by dietary fatty acids. Intake of coconut oil caused highest concentration of fatty
acids 12:0 and 14:0 and lowest concentration of fatty acids 18:1 and 18:2. Intake of corn oil in the diet resulted an increase in the level of fatty acids 18:1 and 18:2 while RHEO and RHKO caused an increase in the concentration of fatty acid 18:1 only. The other fatty acids 16:0, 16:1, 18:0 and 20:4 of plasma were found to be almost similar in the animals fed on normal or different fat-supplemented diets, despite the fact that those levels were slightly modified by the dietary fatty acids.

The fatty acid composition of the depot fat of rats fed different fat-supplemented diets or a normal diet used in the present study are shown in table 35. It was found that the response of the fatty acid composition of depot fat to diet modification was comparatively slow than that of plasma. Coconut oil supplemented diet caused an elevation in the level of fatty acids 12:0 and 14:0 while reduced the level of 18:1 and 18:2. Intake of corn oil, RHEO and RHKO resulted an increase in the level of fatty acid 18:1 when compared with the controls. The concentration of other fatty acids either unchanged or very slightly changed but the changes were non-significant.

The digestibility as determined by fecal fat excretion was found to be 92 and 91 for RHEO and RHKO respectively.
Histopathological examination did not reveal any significant abnormalities in the rats fed either RHEO or RHKO.

Feeding Experiment No. 6:
In this feeding experiment refined Akashmoni seed oil was nutritionally evaluated in a comparative study with growing albino rats. Comparison was made with refined groundnut oil. The results regarding this feeding experiment are given below.

Data on the chemical composition and fatty acid composition of the refined Akashmoni seed oil is given in table 36. In raw condition it contains 2.8% unsaponifiable matter and having high free acid content (acid value 13.4%). Refining of the oil diminished visible colour, reduced the unsaponifiable matter and minimised the acid value. Fatty acid composition of Akashmoni seed oil is similar to that of saturated oil such as coconut oil or sal oil in that, it contains high amounts of saturated fats and low amount of unsaturated or essential fatty acid, linoleic acid. The seed oil has a high stearic acid content (31%) and nearly two-thirds of its glyceride is GS₂U i.e. of the disaturated monounsaturated type mostly SOS i.e. saturated-stearic acid and unsaturated-oleic acid. There were no oxygenated fatty acids as revealed by GLC. Toxic non-glyceride components were not found in the oil.

Food intake, body weight gain, FER, haematological and biochemical estimations of blood are presented in table 37.
Results

Food intake and growth of rats fed diets containing 10 per cent of refined Akashmoni seed oil was similar to that seen in rats fed diet containing 10 per cent ground nut oil. The digestibility of Akashmoni seed oil as estimated by fecal fat excretion was also similar to that of ground nut oil (94). The blood Hb levels of all the animals varied in the range of 15.4 to 15.6 g/100 ml. Serum protein levels of the experimental animals showed no significant differences when compared with the controls. The two oil-dietary groups did not differ significantly with regard to a variety of serum lipid parameters such as total lipid, phospholipids and FFA and all the values were within the normal range of variation. A significant elevated level of serum cholesterol was observed in the rats fed 10 per cent Akashmoni seed oil as compared to that of fed refined ground nut oil.

Liver lipid composition of rats fed Akashmoni seed oil and ground nut oil at 10 per cent level for 30 days, are shown in table 38. The results revealed that total lipid and FFA levels of liver microsomes were significantly elevated in the rats fed Akashmoni seed oil. Liver lipids, and cholesterol and phospholipids of liver microsome did not differ significantly between two groups.

Histopathological findings did not reveal any significant differences in the organs from the rats fed Akashmoni seed
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oil or refined ground nut oil and all the organs were normal. Only the liver section from one rat fed Akashmoni seed oil showed slight fatty changes but this was not a consistent finding and was not seen in the section of livers from other rats of this group. There was no mortality, behavioural abnormality, side effect or any toxic reaction among the rats fed Akashmoni seed oil.