SUMMARY

The following lines summerize the various topics which were handled in the present investigation to study the chemical composition of rapeseed oil and meal beside the evaluation of such materials during feeding experiments.

The method of introducing this summary follows to a great extent the line of approach used in the presentation of the various topics dealt with in this dissertation.

1. **Extraction of oils from two different rapeseed varieties:**

Two different rapeseed samples of Brassica napus, German and French varieties were used in the present study. The oils were extracted from the cursched seeds through hot hexane, mixtures of chlorofom : methanol : water (2.1: 0.8) (skysylof method) and pre-pressing methods. The percentage of oil extracted with hot hexane from German and French rapeseeds were 37.8% and 38.3% respectively.

Refractive index of oils under study were nearly indntical. Specific gravity of the extracted oil with Skysylof method showed higher value than the two other oils. Acid values in this work were small and rather insignificant. Oil of the German variety was little higher in its saponification value i.e. 190.4 than the French variety which amounted to 187.0. Iodine values of the

oils under study were relatively small. The unsaponifiable matters ranged from 1.43 to 1.85% for the obtained oils. The peroxide values and thiobarbituric acid mumber in all samples were relatively small.

2. Fatty acid composition of rapeseed oils (German and French) varieties:

Saturated fatty acids palmetic ($C_{16:0}$) and stearic ($C_{18:0}$) were found in the oils extracted from different methods of German variety amounted 3.9% and 2% respectively while arachidic ($C_{20:0}$) and behenic acid ($C_{22:0}$) were detected in lower amounts. The major constituents of unsaturated fatty acid in oils of German variety were $C_{18:1}$, $C_{18:2}$ and $C_{18:3}$. Oleic acid was the most prevalent one and pre-pressing method yielded the highest oleic acid content i.e. 65.6%. Linoleic acid ranged from 18.1% in pre-pressing method to 19.2% obtained in skysylof method. Linolenic acid was present in all oils in relatively small amounts. Moreover, gadoleic ($C_{20:1}$) and erucic ($C_{22:1}$) were detected in low amounts and ranged between 1.4 to 1.5% and 0.6 to 0.7% respectively. The ratio between total unsaturated to total saturated acids (TU/TS) for German variety of rapeseed oil was 13.7:1.0.

Palmetic ($C_{16:0}$) and stearic ($C_{18:0}$) were also present in the oils of French variety and ranged between 4.0 to

4.1% for the former and 1.7% for the latter while arachidic ($C_{20:0}$) and behenic ($C_{22:0}$) were detected as minor component fatty acids.

Oleic acid ($C_{18:1}$) was present in rapeseed oils (French variety) i.e. 52.1 to 53.1%. Linoleic acid ($C_{18:2}$) and linolenic acid ($C_{18:3}$) ranged from 17.2 to 17.7% and from 8.4 to 8.7% respectively. Gadoleic acid ($C_{20:1}$) was detected in the French variety with relatively high percentage and amounted to 7.2%. Erucic acid ($C_{22:1}$) was relatively high in this variety in comparison with oils of German variety and ranged from 7.2 to 7.4%. The total unsaturated to total saturated (TU/TS) ratio of French variety rapeseed oils ranged from (13.9:1.0) to (14.1:1.0). Such values were higher than the values recommended for common edible oils. In general the proportion of (TU/TS) of rapeseed oil might be considered as imbalanced edible oil.

3. Unsaponifiable matter of rapeseed oils (German and French) varieties:

Unsaponifiable matters of the crude oils of rapeseed (German and French) varieties were fractionated using GLC technique. The hydrocarbon of the German variety contained 14 different components amounted from 81.61 to 82.14% of the total unsaponifiable matter. The major hydrocarbon was C_{28} ranged from 52.28 to 53.47% followed by

C_{20} and C_{26}. B-sitosterol and stigmasterol were the more two main sterols and ranged from 9.38% to 10.08% and from 5.09% to 5.65% respectively followed by campesterol from 2.46% to 2.76%.

The hydrocarbon contents of French variety ranged from 77.21 to 77.93% of the unsaponifiables with predominance of C_{24} which ranged from 39.77 to 42.16% followed by C_{23} and C_{32} hydrocarbons. B-sitosterol and stigmasterol were the main sterols and ranged from 13.18 to 13.92% and from 6.02 to 6.66% respectively. Campesterol was present in small amounts and reached to 2.52%.

4. Biological evaluation of rapeseed oil (German variety):

The extracted oil through hot hexane from German variety of rapeseeds (Low erucic acid content e.g. 0.6%) was choosen to be used in the feeding experiments beside corn oil as control. The effect of these oils after feeding on serum glutamate pyrovate transaminase (S.GPT), serum glutamate oxaloacetate transaminase (S.GOT), alkaline phosphatase, blood urea, blood sugar and total cholesterol in serum were thourhgly studied.

When low eurcic acid rapeseed (LEAR) oil was used in the feeding experiment, it caused significant increase in GOT comparing with corn oil. The change of (GOT) enzyme

serum seems to be related to erucic acid of rapeseed in diet. A noticeable increase in GPT and alkaline phosphatase in the serum of rats after four weeks of erucic acid rapeseed oil feeding. The level of blood urea slightly increased than that of the normal range. Also, blood sugar and total cholesterol highly significantly increased than that of the initial reported values. It could be concluded in this aspect that heart and liver functions might be affected by feeding with rapeseed oil (LEAR) and measuring the formentioned crieterias in blood could be used as a good examination to measure the disturbance arised from feeding with erucic acid rapeseed oil.

5. Chemical composition of rapeseed meal:

The meal after oil extraction with three different methods from two different varieties of rapeseed i.e. German and French, were analyzed for its moisture, protein, reducing and non-reducing sugar, ash and glucosinolate contents. Its percentages ranged from (7.8 to 8.6%), (34.2 to 38.2%), (4.42 to 5.12%), (6.68 to 7.77%), and 0.113 to 1.8mg/g respectively. In addition all samples under study were relatively rich in P,K and Na while Fe and Zn were present in a moderate values, and Cu and Mn contents were founded in relatively trace amounts.

In general German variety contained relatively smaller amounts of glucosinolates than that of French variety,

These compounds was present in lowest amounts in the meal produced through Skysylof extraction method from both German and French varieties i.e. 0.113 and 0.14mg/g respectively.

Although, rapeseed meal is considered as a good source of protein and minerals, but the major problem involved in its use as meal in animal nutrition owing to the presence of glucosinolates. The detoxification of rapeseed meal is now considered as an important step in improving its feeding value.

6. Elimination of glucosinolates from rapeseed meal:

Rapeseed meal of German variety with lowest glucosinolate contents i.e. 0.113mg/g was choosen to investigate the effect of temperature and aqueous leaching on its glucosinolate content. The resulted meal after Skysylof extraction method was heated at 100°C and pH.6.

Heat treatmeht caused a slight decrease in total protein content reached to 33.54% and a slight increase in ash content. All element contents showed minute changes after leaching experiment. In addition, total glucosinolate compounds were highly decreased from 0.113mg/g to 0.002mg/g, resembling about 98% reduction from the original toxic principle.

7. Biological evaluation of rapeseed meal:

Rapeseed meal (German variety) was heated at 100°C for 30 min. followed by continueous leaching at 25°C and pH 6. The resulted clean meal was used as the sole source of protein in the biological evaluation experiments. The untreated rapeseed meal and casein were used as control diets. Evaluation of the treated meal was carried out by measuring its effect on weight gain, alkaline phosphatase, (GPT) and gamma-glutamyl transferase (Y-GT) in serum.

When untreated rapeseed meal was used as the sole source of protein, it caused minimum increase in body weight comparing with casein group, beside the rate of mortality increased and reached 40%. On the other hand, leached rapeseed meal increased the weight gain and no mortality cases were recorded.

8. Effect of glucosinolate rapeseed meal on liver functions:

S.GPT, alkaline phosphatase and γ-GT levels increased in case of using crude rapeseed meal in the diet. A disturbance of liver function might occurred owing to the toxic principles in the meal. On the other hand, leached rapeseed meals showed a reasonable and encouraging results of the liver function tests.