5. SUMMARY AND CONCLUSION

This study was conducted on jojoba seeds and by-product to evaluate their chemical and biological quality as alternative source of protein material. Chemical composition of jojoba seeds grown at El-Kassassin and at El-Sheikh Zoied and their by-products were determined. Physicochemical properties, fatty acids, hydrocarbons and sterols of jojoba oil were identified and determined by gas liquid chromatography. Elimination of anti-nutritional factors from jojoba by-product were curried out. Amino acids composition and jojoba protein subunits molecular weight of jojoba seeds are studied. Beside nutritional evaluation of jojoba meal and their protein isolate were curried.

The obtained results could be summarized as follows:

I: Chemical composition of jojoba seeds and by-products:

The chemical composition of jojoba seeds grown at El-Kassassin and at El-Sheikh Zoid and their by-products were determined, data show that, jojoba seeds contained 4.15±0.09 to 6.38±0.09% moisture, total lipid 48.73±0.59% to 50.95±0.59%. Crude protein 15.35±0.22 to 16.34±0.22%, total carbohydrates 15.35±0.08 to 16.34±0.08%, crude fiber 4.42±0.26 to 5.31±0.26% and ash content 1.61±0.03 to 1.88±0.03%. While defatted meal had 30.58±1.12% crude protein to 32.19±1.12, respectively. Total carbohydrate 40.31±0.11 to 41.95±0.11%. Crude fiber 11.15±0.14% and ash content was found to be 3.20±0.05 to 3.33±0.05% for defatted meal respectively.

Simmondsin in jojoba seeds and meal contained 1.24±0.01% and 2.49±0.02%. Total phenolic compounds content of jojoba seeds, jojoba meal and jojoba by-product were 1.32-1.36%, 2.64-2.72% and 2.67% respectively. Phytate content was found to be 1.19-1.22% and 2.38-2.42% for jojoba seeds and defatted meal.

Since, jojoba meal can be considered as a rich source for protein after removing anti-nutritional factors from the meal.

II. Physicochemical properties, fatty acids, sterols and hydrocarbons of jojoba oils:

a- From the data presented in this study, physical properties of jojoba oils could be noticed that refractive index of jojoba oil seed (grown under salinity stress, 3000 ppm at El-Kassassin) was 1.4604 and jojoba seed oil (grown at Sheikh Zoid) was 1.4634, color 35 yellow and 4.30 red, specific gravity was 0.864 and 0.858 and melting point 11°C. The chemical properties of jojoba oils as follow : Acid value was low (0.71–0.88), saponification value ranged from 93.19 to 94.22, peroxide value was relatively small (0.88-0.91), iodine value ranged from 81.64±0.47 to 83.01±0.47, ester value of oils was 92.32 to 93.51 and unsaponifiable matter of jojoba oil ranged from 49.51 to 52.42%, respectively.

b- Gas liquid chromatography (GLC) was used for determining fatty acids, hydrocarbons and sterols of jojoba oils. The obtained results show that jojoba seed oil contains high amount of unsaturated fatty acid ranged from 99.86% to 99.20% of total fatty acids. Hydrocarbons

content of the unsaponifiable matter of jojoba seed oil (grown under salinity stress 1000 and 3000 ppm at El-Kassassin) were 98.15% and 96.99% and jojoba seed oil (grown at El-Sheikh Zoied) was 97.47% of the total unsaponifiable matter, while the sterols were 1.24%, 1.69% and 1.11% of total unsaponifiable matter for the abovementioned oil.

III. Elimination of toxic compound of jojoba meal

Several processes, including solvent extraction (isopropanol– acetone), heat and chemical methods have been investigated for detoxification of jojoba meal. These processes include removing simmondsin or modification of the cyano group. However, these processes do not completely remove the bitter compounds. The best ratio of solvents for extraction was isopropanol-water (7: 3), which eliminated 83.48% of simmondsin, 51.31% of total phenolic compound and 27.62% of phytic acid presented in defatted jojoba meal. Acetone was less effective but more selective than isopropanol for extracting simmondsin. Ammonical hydrogen peroxide was more effective in removing simmondsin from defatted jojoba meal.

IV. Properties of the protein isolate from jojoba defatted meal

a) Effect of pH on protein isolate from jojoba meal

The maximum jojoba protein extraction was achieved at pH 10.0 and the percentage of extracted protein was 94.13% while at pH 4.8 (Isoelectric point) extracted protein reached its lowest value (20.76%).

b) Determination of jojoba protein subunits molecular weight by using SDS-PAGE

The SDS-PAGE polypeptide patterns of the overall polypeptides in jojoba meal with protein standards showed that jojoba meal protein dissociate into 7 subunits with molecular weight ranged from 57 to 14 KD.

V. Amino acids composition of jojoba seeds

Glutamic and aspartic acids are the most abundant amino acids (14.5% and 10.2%) followed by glycine (7.9%); cystine and tryptophan contents were found to be in minimum quantities 1.5% and 1.2% respectivey. However, the total essential amino acid content was 37.1% comparing to total amino acids.

VI. Nutritional evaluation of jojoba meal and their protein isolate

In this experiment, 60 rats were used in order to study the effect of dietary jojoba meal and their protein isolate on growth of rats, liver and kidney functions and some biochemical parameters of blood. Rats were randomly divided into equal 6 groups (10 rats each).

- The first group of rats fed on basal diet.
- The second group of rats fed on 31.25% treated jojoba meal with isopropanol.
- The third group of rats fed on 31.25% treated jojoba meal with ammonical hydrogen peroxide.
- The fourth group of rats fed on 31.25% treated jojoba meal with acetone.
- The fifth group of rats fed on 10% jojoba protein isolate.

- The sixth group of rats fed on 31.25% untreated jojoba meal.

The experiment lasted for 8 weeks, blood sample and organs sample were withdrawn after 8 weeks.

From the data obtained in this experiment, it can be seen that:

After 12 death began occurring days in the group of rats fed on untreated jojoba meal and the experiment was terminated before the planned 56 day. Lipid profile, triglycerides and total cholesterol have a significant increase. The activity of liver enzymes (ALT, AST) were highly increased. Which indicate the incidence of liver dysfunction. The level of serum creatinine and urea did not altered.

The rat fed on detoxified jojoba meal with isopropanol or jojoba protein isolate had significantly greater body weight gain, food intake, feed consumption and feed conversion ratio than that of corresponding rats fed basal diet. Rats fed diet containing jojoba meal treated with isopropanol or jojoba protein isolate had decreased in serum triglycerides, total cholesterol and LDL-cholesterol and increased in HDL-cholesterol. Total protein, albumin and globulin in rats fed on detoxified jojoba meal or jojoba protein isolate were studied and the obtained results indicated that non-significantly increased compared with control. The effect of detoxified jojoba meal or jojoba protein isolate on liver and kidney function of rats were studied and the result showed a non-significant elevation in ALT, AST and serum uric acid when compared with rats fed basal diet (control).

Conclusion :

Jojoba seed are mainly used for oils. After oil extraction, the resultant meals can be considered as a rich source for protein after removal anti-nutritional factors. It contains 30.58 to 32.19% crude protein. Jojoba meal was subjected to detoxification by several processes, including solvent extraction, heat and chemical methods. The obtained results indicated that, detoxification with isopropanol-water (7 : 3) was the best method. Nutritional evaluation was curred to evaluate untreated jojoba meal, detoxified jojoba meal with different methods and jojoba protein isolate as food stuff on body weight gain, food in take, feed conversion ratio, serum lipid profile, protein and liver, kidney function of male rate. The obtained results indicate that jojoba meal detoxified with isopropanol-water (7: 3) was the best treatment and jojoba protein isolated was a good source for protein than casein protein.