

STUDIES OF 'KALGA' SEED OIL

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INTRODUCTION

Celosia cristata plant locally known as *Kalga* and under the common name of cockscomb belongs to N.O. Amaranaceae which contains 64 genera with 800 species distributed throughout the warmer parts of the world [1]. The principal centres of its distribution are tropical America, India and Pakistan.

Since the most noteworthy plant of the family is probably *Celosia cristata* which on cultivation bears red flowers alongwith seeds, the present studies on the physico-chemical characterisation of kalga seed oil have been undertaken in continuation of these authors' previous work on oils and fats of vegetable resources, prior to deciding about their utility either for edible or industrial purposes in Pakistan.

The seeds (50 g) of *Kalga* were crushed, dried and extracted with distilled hexane. The oil (4.75 g) of pale straw colour was obtained after the removal of the solvent.

The physico chemical values were determined according to the procedure mentioned by L.V. Cocks and C.V. van Rede [2].

The sample of the oil (2 g) was saponified with 0.5N ethanolic potassium hydroxide solution (30 ml) for 3 hr. The saponified mass was treated with 2N sulphuric acid to liberate fatty acids after the separation of unsaponifiable matter by diethyl ether. The fatty acids (400 mg) on reacting with dry methanol (10 ml) and 1% w/w sulphuric acid for 2 hr were converted into methyl esters of the liberated fatty acids.

Five thin-layer chromatograms 20 cm x 20 cm of thickness (0.25 mm) were prepared by the use of silica gel (30 g) and distilled water (45 ml) for the purification of the sample of methyl esters (100 mg). The developing solvent system and the non-destructive locating reagent ether: hexane (1:9 v/v) and 2, 7-dichlorofluorescein were used respectively. The Pye Unicam 204 Series gas liquid chromatography was applied by using a column (152.4 cm x 0.9 cm) prepared by coating polydiethylene glycol succinate (10%) on diatomite "C" (180-100 mesh) at 200°C.

Nitrogen gas was used at the flow rate of 40 ml per minute.

Celosia cristata is a small size ornamental plant which starts growing by the end of July and its seeds mature by the end of September.

Efforts have been made for a long time to investigate the fatty acid composition of oils and fats from various conventional and non-conventional resources [3-13] by chemical methods and instrumental techniques in order to differentiate between the utility of an oil either for edible or industrial purposes eventually to overcome the shortage of edible oil in Pakistan. The oil of *Kalga* contains saturated and unsaturated fatty acids (28.0%) and (72.0%) respectively. Palmitic acid (23.6%) and linoleic acid (43.5%) is of highest percentage among the saturated and unsaturated fatty acids respectively (Table 1). The importance of linoleic acid being an essential fatty acid and a

Table 1. Fatty acid composition and physicochemical characteristics of *Celosia cristata*.

No. Fatty acid	Percentage
1. Lauric	0.9
2. Myristic	0.5
3. Palmitic	23.6
4. Stearic	3.0
5. Oleic	27.7
6. Linoleic	43.5
7. Linolenic	0.8
<i>Characteristics</i>	
1. Moisture (%)	4.7
2. Yield (%)	9.5
3. Free Fatty acids (%)	1.0
4. Iodine value	124
5. Saponification value	182
6. Unsaponifiable matter (%)	0.5
7. Refractive Index at 40°	1.4640

Table 2. Fatty acid composition comparison of *Kalga*, sunflower, groundnut, olive, soybean and cottonseed oils.

No. Fatty acids	Kalga	Sunflower [2]	Groundnut [5]	Olive oil [6]	Soybean [9] (Bragg variety)	Cottonseed [10] (B.S.I. variety)
1. C _{12:0}	0.9	—	—	0.1	—	—
2. C _{12:1}	—	—	—	—	—	—
3. C _{14:0}	0.5	1.5	0.1	0.8	0.3	1.4
4. C _{14:1}	—	—	—	—	—	—
5. C _{16:0}	23.6	11.5	12.9	19.0	13.8	28.8
6. C _{16:1}	—	—	—	1.8	—	2.4
7. C _{18:0}	3.0	Traces	1.9	1.7	5.4	3.5
8. C _{18:1}	27.7	55.0	47.1	65.7	31.8	22.5
9. C _{18:2}	43.5	32.0	31.2	10.9	41.2	41.2
10. C _{18:3}	0.8	—	—	—	6.3	—
11. C _{20:0}	—	—	1.4	—	0.6	0.2
12. C _{20:1}	—	—	2.9	—	—	—
13. C _{22:0}	—	—	1.5	—	0.2	—
14. C _{24:0}	—	—	1.0	—	0.4	—

precursor or prostaglandins is self explanatory [14]. The fatty acid composition recommends that this oil can be utilised for edible purposes. A fatty acid composition comparison of various edible oils (Table 2 shows that linoleic acid has been found in the highest percentage (43.5%) as compared to sunflower (32.0%), groundnut (31.2%), olive (10.9%), soybean of the Bragg variety (41.2%), and cottonseed of B.S.I. variety (41.2%). The present studies therefore suggest that the *Kalga* seed oil for edible purposes is as good as oils of conventional seed crops and of olive fruits.

Key words: *Celosia cristata*; family Amarantaceae; seed oil.

REFERENCES

- G.L. Chopra, *Angiosperms*, (Unique Publishers Lahore 1979), 9th ed.
- L.V. Cocks and C.V. Van Rede, *Oils and Fats Analysis* (Academic Press, London, New York, 1966).
- M. Latif Iqbal, M.Y. Raie, Darbar H. Gilani and M.K. Bhatti, *Pakistan J. Sci. Ind. Res.*, **20**, 2 (1977).
- M.Y. Raie, Manzoor Ahmad and S.A. Khan, *Pakistan J. Sci. Ind. Res.*, **22**, 1-2 (1979).
- M.Y. Raie, Manzoor Ahmad and S.A. Khan, *Pakistan Tobacco*, **4**, 1 (1980).
- M.Y. Raie, Manzoor Ahmad, S.A. Khan, and M.K. Bhatti, *Pakistan J. Sci. Ind. Res.*, **24**, 3 (1981).
- M.Y. Raie, and Manzoor Ahmad, *Pakistan J. Sci. Ind. Res.*, **24**, 3 (1981).
- M.Y. Raie, M. Latif Iqbal, *Pakistan J. Sci. Ind. Res.*, **25**, 3 (1982).
- M.Y. Raie, S. Iqbal and S.A. Khan, *Pakistan J. Sci. Ind. Res.*, **25**, 3 (1982).
- M.Y. Raie, Ijaz Ahmad, Shahina Zaka and S.A. Khan, *Pakistan J. Forestry* (1982).
- M.Y. Raie and M. Latif Iqbal, *Fette Seifen Anstrichmittel*, **85**, 5 (1983).
- M.Y. Raie, M. Ahmad, S.A. Khan and S.A. Akhtar Jafri, *Fette Seifen Anstrichmittel*, **85**, 7, (1983).
- M.Y. Raie and Salma, *Fette Seifen Anstrichmittel* **87**, 6 (1985).
- F.D. Gunstone, *An Introduction to the Chemistry and Biochemistry of Fatty Acids and their Glycerides*, (Chapman & Hall, Ltd., 11, London, (1967), 2nd ed.