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SEED LIPIDS FROM *Crotalaria alata* AND *Guizotia abyssinica*

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Crotalaria alata (Fabaceae) and *Guizotia abyssinica* (L. *f*.) Cass. (Asteraceae) are herbaceous, annual, and upright plants. Both species are excellent feed crops for cattle, sheep, and goats.

Representatives of the genus *Crotalaria* are distributed in America and Australia [1, 2]. Under the climatic conditions of Uzbekistan, *C. alata* can provide two mowings.

The genus *Guizotia* is endemic to southeastern regions of Africa, where 12 species are encountered. In Abyssinia and India, this species is cultivated as an oil crop [2]. Data on the seed lipids of these plants are sparse [3].

Seed lipids of *C. alata* and *G. abyssinica* that were introduced to the F. N. Rusanov Botanical Garden of the AS RU were analyzed.

Seeds (1000) of *C. alata* (38.8 g, 10.7% moisture) and *G. abyssinica* (4.3 g, 5.2% moisture) were studied. Neutral lipids (NL) were extracted from ground samples by benzine (72-80°C) in a Soxhlet apparatus. Total polar lipids were extracted by the Folch method, purified of impurities [4], and separated by column chromatography over silica gel with elution of remaining NL by $CHCl_3$, glycolipids (GL) by $(CH_3)_2CO$, and phospholipids (PL) by CH_3OH. Table 1 lists the content of lipid groups in seeds of *C. alata* and *G. abyssinica*.

Table 1 shows that seeds of *C. alata* have a low oil content. The content of PL in them is <0.6%. The content of total lipids in seeds of *G. abyssinica* reach 36.82% owing to the high fraction of NL.

The components of the isolated lipid groups were established by comparison with authentic comounds and qualitative reactions on TLC under the conditions used to separate NL, GL, and PL [4-6]. As expected, triacylglycerides dominated the NL of the studied samples. They were accompanied by hydrocarbons, carotinoids, esters of aliphatic and cyclic alcohols with fatty acids, free fatty acids, fatty alcohols, triterpenols, and sterols. The carotinoid content in NL of *C. alata* was 38.5 mg%. NL of *G. abyssinica* also contained oxygenated triacylglycerides of various polarity, including epoxyacylglycerides (positive qualitative reaction with picric acid) and hydroxyacylglycerides, which are characteristic of lipids from plants of the Asteraceae family [7].

GL and PL of the studied seeds were similar in qualitative composition. The principal components were mono- and digalactosyldiacylglycerides, sterylglycosides and their esters, phosphatidylethanolamines, phosphatidylcholines, and phosphatidylinosites, which are characteristic of the seeds of higher plants [6, 8].

Table 2 lists the fatty-acid compositions of NL and polar lipid as their methyl esters determined by GC. Hydrolysis of the lipids and GC analysis of methyl esters were performed as before [9]; preparation of methyl esters, by the literature method [4]. Apparently fatty acids of the NL and polar lipid of seeds of both species were highly unsaturated. The principal acids of NL and polar lipid of *C. alata* seeds were 18:2, 18:1, and 16:0. These acids were also the principal components of fatty oils from seeds of previously studied species of Fabaceae [6, 10, 11]. Furthermore, hexadecadienoic acid (16:2) was observed in the acids of polar lipid from this species.

Fatty acids of NL from *G. abyssinica* typically had a high content of 18:2 acid (76.5%). The fraction of this acid in PL and GL decreased by 20-30%, respectively, due mainly to the increased content of 16:0 acid.

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TABLE 1. Lipid Content in Seeds of *Crotalaria alata* and *Guizotia abyssinica*, mass %

Lipids	*Crotalaria alata*	*Guizotia abyssinica*
Neutral	4.14	35.87
Glycolipids	0.57	0.44
Phospholipids		0.51

TABLE 2. Acid Composition of Neutral and Polar Lipids of *Crotalaria alata* and *Guizotia abyssinica*

Acid	*Crotalaria alata*		*Guizotia abyssinica*		
	Neutral lipids	Glycolipids + phospholipids	Neutral lipids	Glycolipids	Phospholipids
12:0	0.1	Tr.	Tr.	0.6	0.2
14:0	0.3	0.2	0.1	1.3	0.4
15:0	0.1	0.1	Tr.	0.6	0.2
16:0	12.8	13.9	10.2	26.8	30.2
16:1	Tr.	Tr.	0.4	2.8	0.7
16:2	-	0.1	-	-	-
17:0	0.3	0.4	Tr.	0.6	0.4
18:0	7.6	7.2	4.7	10.4	6.7
18:1	21.4	29.1	8.1	13.6	4.5
18:2	48.2	43.0	76.5	43.3	56.7
18:3	8.4	4.9	-	-	-
20:0	0.8	1.1	-	-	-
$\Sigma_{sat.}$	22.0	22.9	15.0	40.3	38.1
$\Sigma_{unsat.}$	78.0	77.1	85.0	59.7	61.9

REFERENCES

1. *Soviet Encyclopedic Dictionary* [in Russian], Sovetskaya Entsiklopediya, Moscow (1981).
2. *Biological Encyclopedic Dictionary* [in Russian], Sovetskaya Entsiklopediya, Moscow (1989).
3. F. R. Earle and Q. Jones, *Econ. Bot.*, 221 (1962).
4. M. Kates, *Techniques of Lipidology: Isolation, Analysis, and Identification of Lipids*, Elsevier, New York (1973).
5. D. T. Asilbekova, *Khim. Prir. Soedin.*, 365 (2003).
6. D. T. Asilbekova, *Khim. Prir. Soedin.*, 438 (2004).
7. P. C. Badami and K. B. Patil, *Prog. Lipid Res.*, **19**, 119 (1980).
8. M. Kates and M. O. Marshall, in: *Recent Advances in the Chemistry and Biochemistry of Plant Lipids*, T. Galliard and F. Mercer, eds., Academic Press, London, New York, San Francisco (1975).
9. N. T. Ul′chenko, N. P. Bekker, and A. I. Glushenkova, *Khim. Prir. Soedin.*, 456 (2000).
10. N. A. Artamonova, G. K. Nikonov, K. Nusipbekova, and V. A. Nosulchak, *Khim. Prir. Soedin.*, 750 (1987).
11. K. S. Rao, A. J. Pantulu, and G. Lakshminarayana, *J. Am. Oil Chem. Soc.*, **60**, 1259 (1983).