Chemistry of Natural Compounds, Vol. 33, No. 6, 1997

SOME ASPECTS OF THE APPLICABILITY OF AMPEROMETRIC SENSORS FOR DETERMINING DILOR IN HONEY

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UDC 543.25:542.13:541.135:5417126

Pesticides are substances intended for the fight against pests, plant diseases, and weeds [1, 2]. One of such compounds is dilor (2,4,5,6,7,8,8-heptachloro-4,7-endomethylenebicyclo[4.3.0]non-5-ene), which is widely used in the fight against the Colorado beetle on potatoes, beet pest on sugar beet, grape phylloxera on vines, and other plant pests [3]. It was therefore a matter of interest to determine dilor in feeds and food products, especially in honey, by the amperometric method, which is distinguished by high selectivity, simplicity, and rapidity of performance. The method for the amperometric determination of dilor in honey consists in extracting it with acetone or another aprotic solvent from aqueous solution followed by reextraction with hexane.

The determination of the dilor in the hexane extract is made on a background of potassium acetate (lithium perchlorate, nitrate, and chloride). Another variant is also possible which consists in evaporating the extract to the state of moist water-soluble salts and determining the dilor on a background of universal buffer mixture.

The taking and preparation of the honey samples are carried out in accordance with the unified rules for sampling food products.

Method of Determining Dilor. A solution of 10.0 g of honey in 10.0 ml of distilled water is shaken in a flask with 30.0 ml of acetone or methyl ethyl ketone for 15-20 min. After separation, the lower layer is poured into a flask and is reextracted with 10-15 ml of acetone. The combined acetone extracts are treated with 60.0 ml of distilled water and 15.0 ml of hexane, and the mixture is shaken for 2-3 min. The concentration of dilor is determined amperometrically directly in the hexane extract. In those cases where the determination of dilor is carried out in aqueous media, after the separation of the layers the lower aqueous acetone extract is reextracted with 10.0 ml of hexane and the aqueous hexane extract is poured into a beaker, after which the two hexane extracts are combined, and washed once or twice with distilled water (50.0 ml each time), and the dilor content is determined accurately on a background of universal buffer mixture from its oxidation current with the aid of platinum indicator electrodes at a potential of 0.75-1.25 V.

TABLE 1. Results of the Amperometric Determination of Dilor in Honey (control method — thin-layer chromatography)

Type of honey	GOST*-attested concentration of dilor, μg/kg	Dilor (mg/kg) found by the method (P=0.95; $x \pm \Delta X$)		n	S	$S_r \cdot 10^2$
		control	developed			
Honeydew	168.41	167.94	168.07±1.56	4	0.98	5.8
Monofloral	126.34	125.87	126.12±0.69	5	0.63	5.0
Multifloral	74.26	73.69	74.03±0.51	6	0.57	7.6

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n) is the number of parallel determinations; S) is the dispersion; S_r) is the error; P) is the confidence level; x) the mean value; ΔX) the confidence interval.

*State Standard.

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The results that have been obtained witness the significance and reliability of the proposed method for the electrochemical determination of dilor (Table 1).

REFERENCES

1. N. E. Dekatov, Chemical Measures in the Fight against Weeds in Forestry [in Russian], Moscow–Leningrad (1987).
2. Yu. V. Rakitin, The Use of Growth Substances in Plant Husbandry [in Russian], Moscow (1977).
3. I. A. Kablukov, Beekeeping [in Russian] (1948).
4. V. K. Grishin, Statistical Methods for the Analysis and Planning of Experiments [in Russian], Nauka, Moscow (1985).
5. V. V. Nalimov and N. A. Chernova, Statistical Methods of Planning Extremal Experiments [in Russian], Nauka, Moscow (1965).