Spot and Color Tests for Detection of *Argemone mexicana* Seed Oil

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ABSTRACT

The presence of sanguinarine and dihydrosanguinarine alkaloids imparts toxic properties to argemone oil. Since it has been reported to be a common adulterant in mustard and gingili oils, its detection is important. Spot tests have been developed for the detection of adulteration of edible oils with argemone oil. Some inorganic ions and organic substances have been found to be suitable spotting agents. Acidified ceric ammonium nitrate and sodium nitrite solutions develop bright orange color with argemone oil.

INTRODUCTION

Argemone mexicana, a native of tropical America, has naturalized itself in many countries which offer a moist warm climate. All over India, it grows as a weed in cultivated fields and wild in waste lands. Its rich oil bearing seeds are very similar to mustard seeds in size, shape, and color.

The composition of the oil shows the presence of palmitic, stearic, palmitoleic, oleic, ricinoleic, linoleic and linolenic acids (1). The component glycerides of argemone oil have been reported to be similar to those of maize oil (2). The presence of oxygenated fatty acids in minor amounts (ca. 1%) also is reported (3). There is practically no difference in appearance between argemone oil and any other semidrying vegetable oil. It is, therefore, the most common adulterant of mustard and gingili oils in India. The presence of the two physiologically active alkaloids sanguinarine and dihydrosanguinarine give it highly toxic properties (4). It is, therefore, unfit for animal or human consumption (5).

A rapid change of color to orange was observed (6) during thin layer chromatography (TLC), when sprayed with a solution of antimony trichloride in chloroform. This observation led to the suggestion of using this technique for the quantitative estimation of the small amounts of argemone oil present in the adulterated edible vegetable oils (7). Ceric ammonium nitrate in dilute nitric acid produces highly colored oxidation products with aromatic amines. The colored products can be used for the characterization of aromatic amines (8). The same test could be applied for the detection of synthetic drugs of pharmaceutical interest (9). The dry spot produced on a filter paper by an acidified ether solution of argemone oil observed underr UV light through Wood's filter was fluorescent (10). Aromatic amines in ether solution on addition of sodium nitrite solution and acidification with dilute sulphuric acid develop yellow-violet colors depending upon the nature of amines (8).

The present work reports spot tests for the quick identification of the presence of argemone oil in other vegetable oils. Observation was made of the development of color by the various inorganic and organic substances. The development of color on reaction with ceric ammonium nitrate also has been found to be a satisfactory test for the detection of argemone oil. Color reaction also was carried out with sodium nitrite solution which was found to be the most sensitive test.

MATERIALS AND METHODS

Argemone mexicana seeds were collected from the surroundings of the Osmania University campus. The oil was solvent extracted from the dry seeds with light petroleum. Mustard and gingili seed oils were extracted from the seeds obtained from market. Refined coconut, gingili, and safflower oils also were procured locally. All the solvents and reagents were of laboratory reagent (L.R.) grade. Whatman 40 filter paper was used for spotting.

Solutions of water-soluble salts (10%) were used for spotting. The organic compounds were used undiluted. A spot of the oil was marked on a filter paper with a capillary tube. The reagent was spotted just 1/2 cm apart using another capillary. At the junction of the advancing fronts a color zone developed which remained permanent on the filter paper. Tests were made both pure argemone oil,

TABLE I

Relative Intensity of Spots Developed

Sequence no.	Reagents	Color[a]	Argemone oil in mustard oil[b]			Mustard oil	Gingili oil(crude)
			100%	10%	2%		
1	Ceric ammonium nitrate	O.B	****	**	*	—	—
2	Boron trifluoride in methanol	O	***	**	*	—	—
3	Phosphotnugstic acid	O	**	*	—	—	—
4	Aluminium chloride	O	***	*	—	—	—
5	Uranium acetate	O	***	**	—	—	—
6	Cuprous nitrate	O	***	**	—	—	—
7	Cupric nitrate	O	****	**	—	—	—
8	Ferric chloride	O.B	****	**	—	—	—
9	Antimony trichloride	O	****	**	*	—	—
10	Silver nitrate	O	****	*	—	—	—
11	Potassium ferricyanide	—	—	—	—	—	—
12	Potassium ferrocyanide	—	—	—	—	—	—
13	Salicylic acid	O.Y	**	—	—	—	—
14	o-cresol	O	***	**	—	—	—
15	p-cresol	O	**	—	—	—	—
16	Phenol	O	****	**	*	—	—

[a]O = orange; O.B = orange brown; O.Y = orange yellow; --- = negative.

[b]* = weak intensity, ** = medium intensity, *** = strong intensity, and **** = very strong.

mustard oil, mustard oil admixed with 2% and 10% argemone oil, refined safflower, gingili, and coconut oils.

A solution of ceric ammonium nitrate was prepared in dilute nitric acid which was added in an ether solution of argemone oil. Solution of sodium nitrite (10%) was added to a small quantity of argemone oil dissolved in ethyl ether. Color developed on acidification with 0.5-1 ml of dilute sulphuric acid.

RESULTS AND DISCUSSION

Refined mustard, safflower, gingili, and coconut oils did not respond to any reagents. Argemone oil and mustard oil adulterated with argemone oil developed orange and orange brown spots. The results are summarized in Table I. Best spots were developed with ceric ammonium, uranium, cupric, cuprous, ferric, antimony, and silver ions. Ferricyanide and ferrocyanide ions did not respond to this test. Among the four phenols employed, phenol and o-cresol developed the best spots. Spots developed with inorganic ions were better than those developed with phenols.

Adulteration with argemone oil down to 2% could be spotted with ceric ammonium nitrate, boron trifluoride, and antimony trichloride. An orange brown color was observed to develop on the addition of an acidified ceric ammonium nitrate solution to an ether solution of the adulterated oil samples.

Sodium nitrite solution was observed to give a bright orange color both with argemone oil and with admixtures of argemone oil and other edible oils. The intensity of the color was observed to depend upon the amount of argemone oil, while crude and refined gingili oils did not develop any color. The presence of 0.003% argemone oil could be detected

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