PHYSICO-CHEMICAL COMPOSITION OF THE FIXED OIL FROM *PRUNUS AMYGDALUS*

by

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SUMMARY

The oil extracted from the fruits of bitter variety of "Prunus amygdalus" was analysed for its physico-chemical constants and the fatty acid composition. It was found to be a typical semidrying oil comparing favourably with oils from warmer climates but less unsaturated than the English oils. The HCN content of the oil was also investigated.

Introduction

Owing to its almost universal application as an emollient, and as a componant of a variety of nervous and medicinal preparations, the oil expressed from the fruits of bitter almonds i.e. *Prunus amygdalus* has long been a subject of investigation by a number of scientific workers both in Asia and Europe. It has also been described to possess laxative properties (15). The plant has been reported to have sufficient growth in Baluchistan, (15) and Chitral. As the presence of a bitter principle, amygdalin, renders the fruits unsuitable for edible purposes as such, the present study was taken up with the object of finding the yield and chemical composition of the oil from fruits of indigencus plants and comparing it with the oils from exotic species, in order to explore the possibility of its commercial utilization.

Review of Literature

The almond crops from Russian habitats are reported to be good oil yielders i.e. 46.6—48.0% than the English samples (9, 10, 11). Polenko (12) observed a considerable rapidity in the rate of increase of oil content from almonds during the one month period of June to July. The oil is reported to exhibit a degree of constancy in its iodine number and

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refractive index during the opening phases. The representative samples from European regions when compared with Indian oil (10), gave high iodine values, and high saturated fatty acid content, but the oleic acid drops to almost half the ratio (77.00; 43.00). The increased iodine no. is due to elevated levels (44.3%) of linoleic acid in the oil as against the usual limits of 17—21% for the warmer regions. Light yellow Italian oil had structural features lying in close proximity to English oils, barring the oleic acid content, which was poorer (21.00—25.9%) as against 43.8% for English samples (13). Some of the workers have isolated essential oil fractions in the bitter almonds (3). Furguosan (3) and Pavlenko (12) have shown the existance of a cyanogenetic glycoside, amygdalin, from the bitter variety of *Prunus amygdalus*. The former reports the presence of a 2—4% HCN (a hydrolytic product of amygdalin) in the oil expressed from this variety and discusses the steps to prevent the hydrolysis of amygdalin during the course of oil expression. Fitelson (2) lists the squalene content of oil.

Material and Methods

The almond fruit samples were supplied by the Medicinal Plants Branch of Pakistan Forest Institute. The oil was obtained from deshelled kernels through solvent extraction, making use of petroleum ether as a solvent. The physico-chemical constants were determined by the usual standard methods outlined by A.O.A.C.(5), and Jamieson (6). The isolation of various fatty acid fractions was conducted by fractional crystalization and precipitation techniques outlined by Rosenthallar (14). The HCN content of amygdalin in the oil was determined by the standard method of Jenkin (7). It includes treatment of freshly prepared Mg (OH)2 with the oil samples which causes splitting of glycosidic cyanohydrin. The resulting Mg (CN)2 is titrated with a standard solution of $AgNO_3$ using K_2CrO_4 as indicator. Each ml. of O. IN $AgNO_3$ used in the formation of Ag CN during the titration is equivalent to 0.002703 gm. of HCN.

Results and Discussion

The oil content from the seed kernels comes to be 37.7%, which though, lower than the exotic samples, possesses a sound commercial viability. The HCN content in the oil was found to be 2.12%. The results of various physico-chemical constants in comparison with the work conducted by other scientific investigators have been shown in Table 1.

The iodine and sap. values lie in close agreement to those generally observed for oils from Indian, or other warmer sites. The iodine value of the English oils is more as compared to our indiginous sample. It means that the oil falls in the non-drying class while English variety falls in the semi-drying class. The HCN content in the oil sample is 2.12% while *Furguosan* reported 2=4%.

The quantitative picture of the fatty acid contents Table II) also presents almost identical similarity, with the linoleic and oleic acid percentage lying within the general range of 17—20% and 77% respectively for the oils from warmer habitats. The difference in chemical makeup of the oil is, however, wide when compared with English samples which exhibit a high degree of unsaturation. (Table II).

TABLE I

Physico-chemical constants of *Prunus amygdalus* oil as compared with exotic species

Srl. No.	Name of the constant	Laboratory work	Mear (10)		Pifferi (13)	Jamieson (6)		Bush (1)
			English sample	Samples from warmer climates		Indian samples	General range for other habitats	
1.	Acid value	0.4	0.8	—	—	—	—	0.6
2.	Saponification value	190.0	—	—	179-182	189.2	183-207	188.9
3.	Iodine value (Hanus)	95.0	113.9	99.55	112-113	96.6	99-104	103.8
4.	Specific gravity at 15°C	0.9184	—	—	0.905-0.908	0.919	0.9175-0.9199	0.9156 at 25°C
5.	Ref. Index	1.4721	—	—	1.418-1.483	—	—	1.4727
6.	Peroxide value	7.91	—	—	—	—	—	—
7.	Thiocyanogen value	77.36	—	—	—	—	—	—

TABLE II

Chemical composition of the oil as compared with the oil from exotic species

Sl. No.	Name of the constituent	Laboratory work	Meara (10)		Hilditch (4)	Pfferi (3)
			English sample	Samples from warmer climates		
1.	Saturated fatty acids	6.2	11.9%	2—5%	—	—
2.	Unsaturated fatty acids	86.4%	—	—	—	87.88%
3.	Palmatic acid	5.2%	—	—	4.5%	7.7—8.6%
4.	Oleic acid	75.2%	43.8%	—	77.0%	21—25.8%
5.	Linoloic acid	17.8%	44.3%	17.3—30%	17.0%	45—45%
6.	Squalene content	200gm/100gm.		—	—	—

Conclusion

With a comparatively low quantitative yield i.e. 37.7% as compared with 48.0% of Russian sample the oil from indigenous wild almonds seems to show a bright qualitative picture, useful for its commercial exploitation in multiple uses such as in cosmetics and a variety of nervous and medicinal preparations.

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