

## EXPERIMENTAL CULTIVATION OF *SILYBUM MARIANUM* AND CHEMICAL COMPOSITION OF ITS OIL

Sadaqat Hamid, Abdul Waheed Sabir, Shafiq Ahmad Khan and Perveen Aziz

*PCSIR Laboratories, Lahore, Pakistan*

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*Silybum marianum*, known as Lady's thistle (N.O. Compositae), is a wild growing herb used as medicine for liver diseases. This plant has been successfully cultivated in the experimental fields of the PCSIR Laboratories, Lahore with a view to studying its feasibility as an oil seed crop. It has been observed that the per acre seed yield and percentage of oil are 600 kg and 25.7 % respectively. The fatty acid composition (percentage by wt) of the oil obtained from the seeds is linoleic 42.11, oleic 36.45, palmitic 9.728, stearic 7.067, arachidic 3.3 and behenic 3.04 %.

### INTRODUCTION

*Silybum marianum* is a member of the Compositae family and grows wild in most parts of the Punjab and the North West Frontier Province during winter [1]. The plant and its seeds are used for medicinal purposes in the treatment of various liver diseases [2]. The plant also yield 25.7 % of a good quality semi drying oil. The per acre yield of seeds has been found to be about 600 kg which compares well with sunflower (800 kg/acre) and safflower (500 kg/acre) [2]. Keeping in view the great potential of *Silybum Marianum* as a source of oil seed crop, experiment cultivation of the plant was undertaken at the experimental farm of PCSIR Laboratories, Lahore.

The present paper reports the results of this study as well as composition of the oil obtained from the plant.

### EXPERIMENTAL

#### *Materials and Methods*

i) *Source of Seeds and Their Viability Tests.* Seeds were collected from wild growing plants in the vicinity of Islamabad and Peshawar. Out of 2 kg seeds 20 seeds were planted in the pots in the months of Oct/Nov. and the germination observed.

ii) *Sowing, Transplantation and Preparation of Field Beds.* The pots were kept in day light and watered regularly. The seeds germinated after the 3rd or the 4th day of sowing. When the seedlings were 8 cm. high (15 days) they were transplanted in the experimental fields.

Field beds covering an area of one acre were ploughed thoroughly and then levelled. A suitable quantity of loamy

soil was thoroughly mixed to a depth of 33-35 cm during ploughing. Parallel ridges 15-20 cm high and 40 cm apart were made on the levelled field. Seedlings of height 8 cm were transplanted in the field on these ridges. The transplantation was effected in the beginning of December and irrigation immediately started to continue till the formation of flowers. The flowering started in the beginning of April and in all four irrigations were sufficient till the inflorescence matured to provide seeds.

iii) *Seed Harvesting, Drying and Yield.* The crop was harvested in the end of April till the third week of May. The seeds were collected from the inflorescence by hand thrashing and dried in the sunlight for 3-4 hrs. The yield of seeds per acre was 600 kg. The data showing eco-meteorological conditions for *Silybum marianum* cultivation is given in Table 1.

#### *Extraction and Examination of Oil*

The seeds (100 g) were crushed in a pestle and mortar and then extracted in soxhlet extractor with hexane (b.p. 60-65°). The extracts were dried (Na<sub>2</sub>SO<sub>4</sub>) and the solvent removed under reduced pressured to provide a clear, light yellow coloured oil (25.7 g). The yield of the oil and its different physico-chemical characteristics, as determined by standard techniques [4] are recorded in Table 2.

*Analysis of Component Fatty Acids of Oil.* The oil (5.0 g) was saponified with 0.5 N alcoholic caustic potash (50 ml) by refluxing under nitrogen atmosphere for 6 hrs. The non-saponifiable matter was removed by extraction with diethyl ether and the fatty acids were liberated by 4N sulphuric acid to the aqueous soap solutions. Dried fatty



Table 1. Eco-Meteorological data of *Silybum marianum*.

Sr. No.	Stages	Time	Temperature °C		Humidity %		Rainfall inches	Soil	Irrigation
			Min.	Max.	Min.	Max.			
1.	Sowing	15.11.81	11.1	24.6	55	87	0.00	Loamy	Thrice a month
2.	Germination	21.11.81	11.0	25.3	50	87	"	"	"
3.	Flowering	21. 1.82	05.0	21.3	41	100	0.00	"	Fortnightly
4.	Fruiting	26. 3.82	11.0	23.3	62	97	"	Loamy	Monthly
5.	Harvesting.	25. 4.82	22.0	36.4	42	52	0.10	"	Monthly

Table 2. The yield and physico-chemical characteristics of *Silybum marianum* seed oil.

1.	Oil – 25.7%	
2.	Specific gravity – .89	
3.	Iodine value – 108.2418	
4.	Acid value – 2.0939	
5.	Saponification equivalent – 224.695	
6.	Peroxide value – 8.2 mili equivalent/kg	
7.	Fatty acid composition (% by GLC).	
	i) Linoleic	42.11 %
	ii) Oleic	36.45 %
	iii) Palmitic	9.728 %
	iv) Stearic	7.067 %
	v) Arachidic	3.3 %
	vi) Behanic	3.04 %

acids were then converted to their methyl esters. The methyl esters were analysed by vapour phase chromatography on 10 % polydiethylene glycol succinate (PDEGS) 1.5x4.0 mm glass columns using nitrogen as carrier gas and flame ionisation detector. The column temperature was maintained at 200° and the nitrogen flow was 40 ml/min [5]. The identification and percentages of the fatty acids were determined from the retention times and the peak areas of the methyl esters and are given in Table 2.

## RESULTS AND DISCUSSION

Sunflower and Safflower are cultivated as oil seed crops in all parts of the world. These two oil seed crops have been commercialised by adaptation and selection of various genotypes from the wild growing parents. On the same ana-

logy it was considered worthwhile to examine the possibility of cultivating *Silybum marianum* as a crop because it grows abundantly in the wild state under Pakistani conditions. The present findings suggest that this wild-growing plant can be converted into an oilseed crop. Owing to its insect pest resistance it appears to have an edge over both safflower and sunflower. Additionally, *Silybum marianum* requires less irrigation and postplantation care and, hence, its cultivation in the Barani areas as well as the fallow lands is recommended. In view of the ever-growing vegetable oil demands of Pakistan, the cultivation of *Silybum marianum* alongwith other oilseed crops is advisable.

In order to introduce a new crop, three factors need serious consideration. Firstly, the new crop should not interfere in the existing cultivation pattern. Secondly, it should be superior both in yield and quality and also require less inputs. Thirdly, the new crop must have multiple uses so that it is not only attractive to the farmers but is also economical. *Silybum marianum* has all the three qualities and if it is commercially grown, it can yield Silymarin alkaloid in addition to the oil.

The fatty acid composition of *Silybum marianum* seed oil is rather attractive and suitable for edible purposes. With oleic (36.4 %) and linoleic (42.11 %) acids as the major constituents, the composition of this oil is comparable with corn oil that is also rich in liquid acids [6]. For edible purposes this oil could be used as such after proper refining to eliminate all impurities including the alkaloidal constituents or consumed after hydrogenation depending on the eating habits and tastes of the consumers.

## REFERENCES

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