

## Comparative Physiochemical Analysis of Seed Oil from *Silybum marianum*, a Medicinal Plant

Waliullah Khan<sup>1</sup>, Iqbal Hussain<sup>2</sup>, Anadil Gul<sup>3</sup>, Murtaza Hussain<sup>3</sup>, Dilawar Farhan Shams<sup>4</sup>

<sup>1</sup> Assistant Professor, Department of Chemistry, Abdul Wali Khan University Mardan,

<sup>2</sup> Department of Chemistry, Islamia College University, Peshawar, Pakistan

<sup>3</sup> Department of Chemistry, Kohat University of Science, Kohat, Pakistan

<sup>4</sup> Department of Environmental Sciences, Abdul Wali Khan University Mardan, Pakistan

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### ABSTRACT

*Silybum marianum* is an important medicinal plant, belonging to family composite. This plant is an annual or biennial herb that has been widely used in traditional system of medicine, particularly in treatment of various liver and bile related diseases. Due to its high potency, its use as natural hepato protective herbal tonic, and its high pharmaceutical and health demand throughout the world, the present study was aimed to carry out the analysis of different physiochemical parameters including saponification value, ester value, acid value, iodine value, and peroxide value of *S. marianum* seed oil collected from different areas of Khyber Pakhtunkhwa province of Pakistan and compared with those of sunflower oil.

**KEYWORDS:** Biogas; economic; environmental; questionnaire survey; sustainable; Swat.

### 1. INTRODUCTION

The use of medicinal plants for treatment of various diseases is known from ancient times. For instance, Leprosy was treated for the first time with the help of chaulmoogra oil obtained from *Hydnocarpus gairdneri* [1]. Now a day's medicinal plants play a significant role in the field of medicine, therefore they are more focused [2]. A report by World Health Organization showed that 80% population of developing countries depends upon the use of traditional medicines for health care. Modern pharmacopeia proposed that 25% drugs have been derived from plants. Similarly, synthetic drugs are also built on prototype compounds isolated from plants [3].

*Silybum marianum* commonly known as milk thistle is an annual or biennial herb, belonging to family Asteraceae (Compositae) with stem (20 to 150 cm high), leaves (25 to 50 cm long, 12 to 25 cm wide) and fruit (15 to 20 mm long). The stem branches at the top and reaches a height of 4 to 10 ft. The leaves are wide blotches with veins. The flowers are red purple. The small, hard skinned fruit is brown spotted and shiny. Milk thistle is easy to grow and it matures in less than a year. It is indigenous to North America, Asia minor, Southern Europe and Russian Federation, while it is naturalized to South and North America, Australia, China, Central Europe and is also found as wild plant in Khyber Pakhtunkhwa and Punjab areas of Pakistan [3,4].

*S. marianum* have two varieties on the basis of flower colour, one with white and the other with blue flowering Capitulum. Similar to other vegetable oil seeds, almost 20-30% of *S. marianum* is composed of lipids, the major source of energy in oil [5]. Lipids have two broad categories i.e. fats and oil. Fats and oil are complex triglycerides. They have nutritional as well as industrial importance. They are best solvent for fats soluble vitamin and add flavour to food. Fats/oil provides essential fatty acid such as linoleic acid, linolenic acid and arachidonic acid not prepared by body. In therapeutics fat/oil are used as drug dispersants. The oil extracted from *S. marianum* contains phospholipids and vitamin E, so it is a good natural source of vitamin E [6-7].

The study was carried out to analyse the physiochemical properties of *S. marianum* seeds oil including saponification value, iodine value, acid value, peroxide value, and ester value with a comparison of blue and white flowering capitulum seeds oil of different areas on the basis of these parameters as well as comparison with those for sunflower oil. Therefore, the aim of this study is to (i) first compare the seed oil of different areas on the basis of these parameters, (ii) comparison between two varieties i.e. blue and white flowering capitulum and (iii) and comparison with edible oil (sun flower oil) to check whether this oil is edible or not.

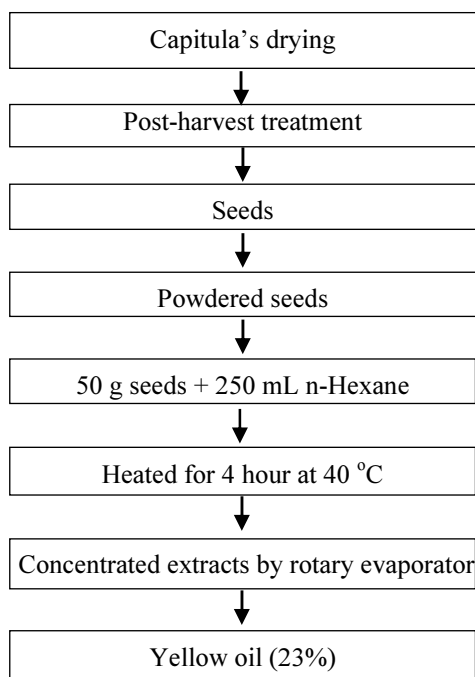
### 2. MATERIALS AND METHODS

#### 2.1 Sample collection

The mature seeds of blue and white flowering Capitulum were separately collected from 7 different areas of the Khyber Pakhtunkhwa Province of Pakistan including Karak, Kohat, Peshawar, Swabi, Mardan, Khyber agency, and Nowshera.

## 2.2 Extraction of oil

Extraction of oil is explained by the following flow chart.



The acid value, iodine value, peroxide value, ester value and saponification were determined by standard methods of the Association of official analytical chemist.

## 3. RESULTS AND DISCUSSION

The analytical parameters including saponification value, acid value, ester, peroxide and iodine values are depicted in Table 1 and Fig. 1 below.

**Table 1.** Different parameters of *S. marianum* seed oil.

Area	Saponification value (mg KOH/g)	Acid value (mg KOH/g)	Ester value (mg KOH/g)	Peroxide value (mg O <sub>2</sub> /g)	Iodine value (mg I/100g)
Kohat. B	192	1.4	190.6	16.2	122
Kohat. W	188.1	1.2	186.9	18	118
Peshawar. B	198.2	1.1	197.1	14.4	110
Peshawar. W	196.6	1	195.6	16.2	107.2
Mardan. B	188	1.3	186.7	18.2	118.4
Mardan. W	186	1.03	184.9	20.1	114.4
Nowshera. B	178	1.03	176.5	16.3	116
Nowshera. W	174	1.4	172	18.2	114.2
Sawabi. B	196	1.2	194.8	14	110.5
Sawabi. W	195	1.1	193.9	16.4	109.4
Karak. B	182	1.6	180.4	12.6	109.4
Karak. W	178	1.4	176.6	14.4	118.6

Table 1 and Fig. 1 shows the different parameters of *S. marianum* seed oil. Saponification value of blue flowering Capitulum is different from the white flowering Capitulum as Kohat blue Saponification value is 192 mg KOH/g and Kohat white is 188.1 mg KOH/g, Peshawar blue is 198.2 mg KOH/g and Peshawar white is 196.6 mg KOH/g. Similarly, for all the others parameters (acid value, ester value, peroxide value, and iodine value) there is a difference between the blue and white flowering Capitulum.

Table 1 also shows a difference in all parameters for the different areas. In case of saponification value, the plants seeds collected from Peshawar area have highest saponification value, while those collected from Nowshera have lowest value.

In case of acid value the seeds collected from Karak area have 1.6 mg KOH/g highest acid value while those collected from Peshawar have 1.0 mg KOH/g which was lowest. In case of ester values, plants seeds collected from Peshawar have highest value while those of Nowshera have lowest. Peroxide values of the

samples collected from Mardan were highest and Karak were lowest. Likewise, iodine values of the seeds collected from Mardan were highest while those of Peshawar were lowest.

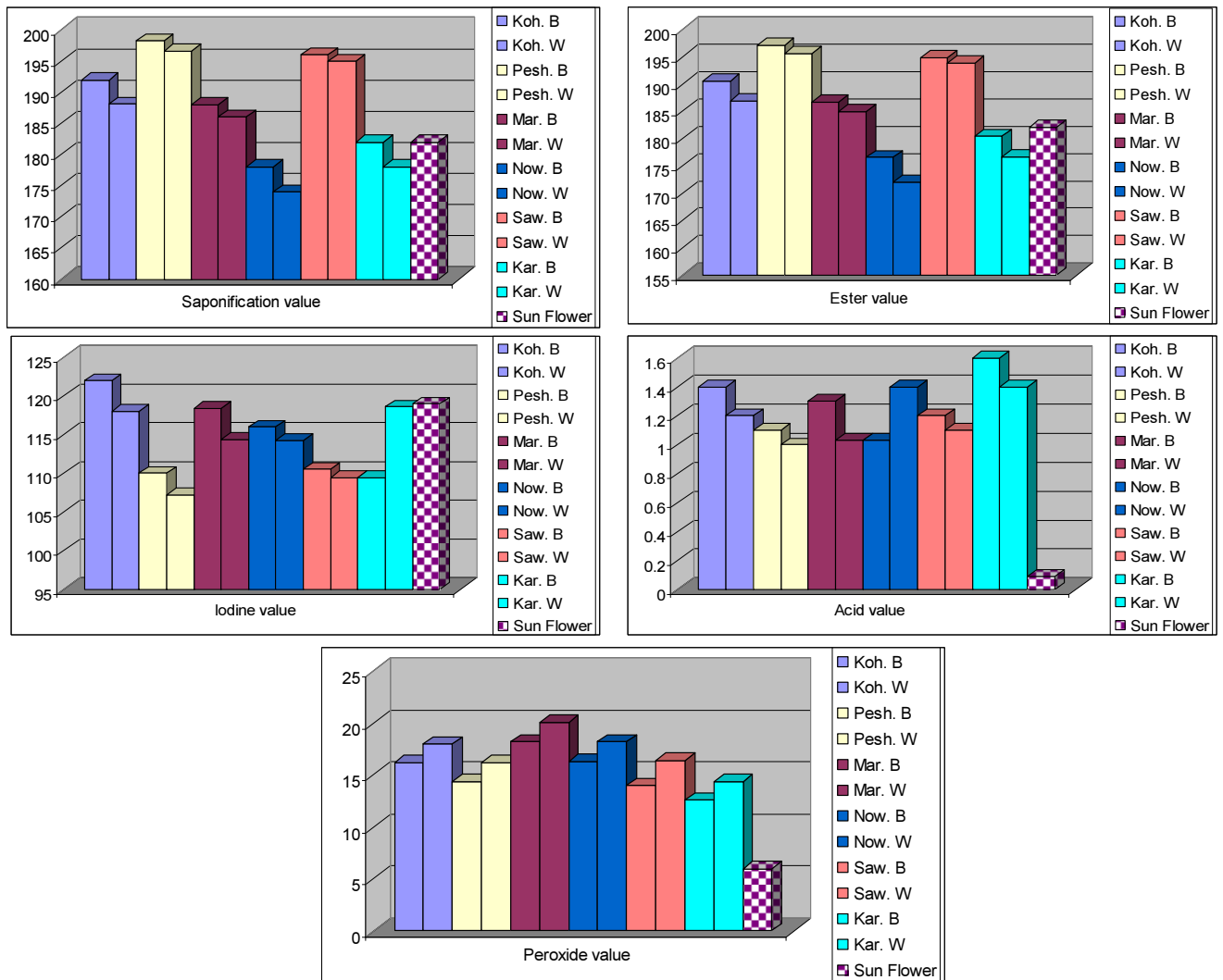


Fig. 1. Saponification, Ester, Iodine, Acid and Peroxide values of *S. Marianum* seed oil of different locality of Khyber Pakhtunkhwa Province in comparison to Sunflower oil

Table 2. Different parameters of the Sunflower oil [8]

Parameters	Concentration
Saponification	182.0 (mg KOH/g)
Acid value	0.092 (mg KOH/g)
Ester value	182.0 (mg KOH/g)
Peroxide value	6.0 (mg O/g)
Iodine value	119.0 (mg I/100g)

A comparison of Table 1 and Table 2 reveals that the three values out of these five i.e. saponification, iodine and ester value were approximately the same, however the acid and peroxide value exhibited a difference.

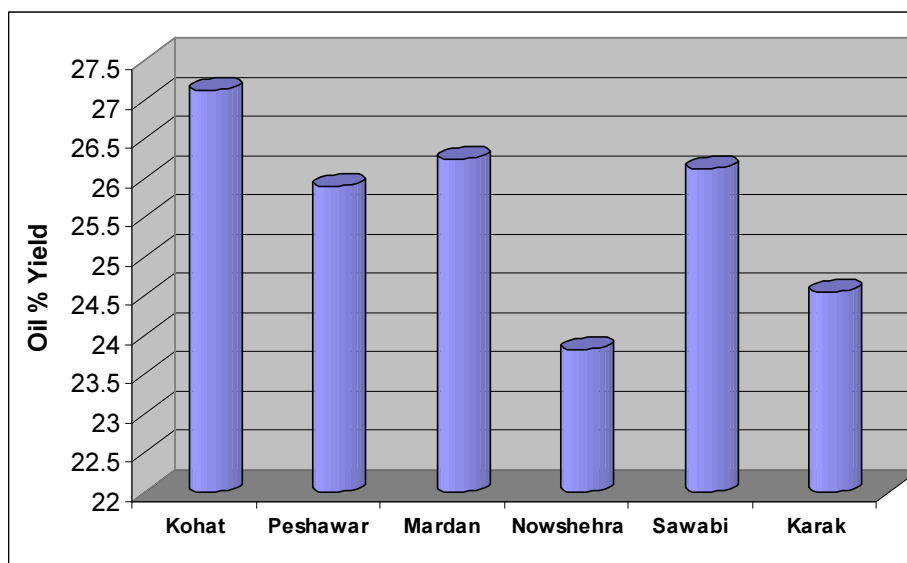


Fig. 2. Comparative % yield of *S. Marianum* seed oil in different localities of KPK

As lipid are the major source of energy, the lipid content of the *S. marianumis* also different with respect to the different area which may be due to different environmental condition.

#### 4. CONCLUSIONS

The present study was an attempt to use the oil of *S. marianum* as edible oil for domestic purposes. The analysis of the seeds oil of *S. marianum* collected from different regions in Pakistan was carried out following standard methods. The results showed that physicochemical parameters of the seeds oil exhibited marked difference for the different regions. In addition, the values obtained were compared with the sunflower oil and a significant difference in acid and peroxide value was found. Thus based on these results, it is concluded that the oil cannot be used for edible purpose due to variable physicochemical parameters.

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