

## Cultivation, Introduction and Historical note of the Benibana (Safflower : *Carthamus tinctorius* L.) in Yamagata Prefecture.

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The simple but elegant safflower, the prefecture flower of Yamagata, has a long and rich history. Although it is too often overlooked, it has played an important role in the history of the Middle East, China, Japan, and other of the world.

From early times in Japan it is referred to in songs and poems, and it may even be said that without the benibana (Safflower), there would have been no traditional Japanese textile dyeing crafts. In writing the history of Yamagata Prefecture, it is impossible to omit the story of the Mogami benibana and its origins<sup>4)</sup>.

### A. Historical note

The safflower is usually said to have originated in the Nile River Valley of Egypt. In ancient Egypt, it was used for crimson in cosmetics. Investigation of the mummies reveals its wide use at the court ; there was no color thought by the ancient Egyptians to be as passionately expressive as crimson.

From the Middle East, the safflower spread into India and later over the Silk Road into China. It was from China that the safflower is thought to have entered Japan, at the time of Emperor Oonin (200-500 A. D.). In Japanese legends and poems of the time, it is referred to by such names as Kurenai and suetsumu-hana. The former is a shortening of Kurenai, the indigo flower of the Wu dynasty, indicating that it entered Japan at the time of the Wu dynasty in China. The latter term comes from the fact that because the flower of the safflower develops from the end of the stem, one plucks the flower by its end (suetsumu-hana = end-plucking flower = terminal flower).

The earliest use of the safflower dye in Japan is said to be in the Kachō Monyō (works of art at

the ancient Nara court featuring Chinese motifs of flower and birds), now preserved at Shosoin in Todaiji temple. It was used widely by the ladies of the Heian court (799-1192) as a rouge and lipsticks, but its real flourishing in Japan did not come until the Edo period<sup>4)8)</sup>.

The earliest record of benibana culture in Yamagata is in the Murakagami of Satoyasu GAMO (1595); it was grown then, as today, in the fields of Nanyo and Takahata districts ; the alpine climate is said to improve the quality of the rouge. It entered the Mogami region in early Edo and by early Meiji reached its zenith with a cultivation acreage exceeding 1,400 hectares. Yamagata Prefecture was then, and remains today, the main producing area in Japan. It was processed locally into a pulpy state (benibana mochi) and shipped by river boat down the Mogami River ; from the Japan Sea port of Sakata, it was then shipped to Kyoto where it was used in Nishijin textile making and the manufacture of lipstick and cosmetics. Its importance to common people is reflected in its appearance in popular songs of the day, and aspects of cultivations and processing practices of the day are captured in paintings.

With the development of chemical dyes in the Meiji period, the demand for safflower declined somewhat, and today it is cultivated only in the Dewa area surrounding Yamagata City. However, recently with the new variety Showa benibana, it has returned in importance, and its value as a natural dye, in cosmetics, and for medicinal purposes is now recognized once more.

### B. Botanical description

The safflower is an annual (sometimes biennial) plant. This produces many branches with flower

heads at their end. Each head consist of numerous floret and may produce from 10 to 40 or 60 seeds in Japan.

The flower color varies with variety, from red through orange and yellow to white. The safflower have spine on the leaves and leafy bracts. Present commercial (ornamental) varieties has been spent on developing spineless, but thus far all such varieties have had a lower oil content or a lower yield of pigment than spiny varieties<sup>2)3)</sup>.

The flowers bloom out in order from the top of main stem to its lower branches. The flowers begin to bloom at early in the morning (4 a. m. - 6 a. m.), the stigmas are already covered with pollens<sup>6)</sup>.

The seeds are greyish-white or white, and shaped like small sunflowers.

### C. Cultivation

Yamagata Prefecture is Japan's leading producer of safflower. In the past, it was valued for its use in cosmetics, especially rouge, but with the development of chemical coloring and dyeing agents, production declined. Now, with improvements in chemical processing techniques, recognition of the value of natural dyes and coloring agents, and contract cultivation, production is once again on the increase. In 1972, of a national cultivation acreage total of 48 ha., Yamagata's share was 36 ha., or 75% of national acreage devoted to safflower cultivation. Of the national production total of 3,360 kg., Yamagata accounted for 2,836 kg., or 84% of national output. Table 1 demonstrates the rapid, recent rise in safflower cultivation<sup>1)</sup>.

This is due to a number of factors, among them :

Table 1. Acreage, production and value of safflower in Yamagata Prefecture<sup>1)</sup>.

Crop year	Harvested acreage ha	Production kg	Total value 1,000yen
1968	13.2	413	2,946
1969	12.8	795	6,019
1970	15.0	1,419	10,684
1971	36.4	1,270	21,593
1972	35.9	2,836	22,692

- a) contract cultivation, begun in 1965, which offers relatively stable market conditions.
- b) effective control of *Anthracnose*, previously the most dangerous disease to the safflower<sup>5)</sup>.
- c) improved cultivation techniques such that principal labor is now light, intensive work allowing women and children to become the principal workers.
- d) improved species through breeding at Yamagata Agric. Exp. Sta..
- e) increasing variety of uses of the flower. Beside its use as a source of rouge in cosmetics, it has come to be valued as a topquality dye and as a coloring agent in foods and candies. Oil extracted from its seeds has been found to have medicinal properties, and it is appearing in markets as a flower used in ikebana (Japanese flower arranging), as a dry flower etc.

### D. Profitability and forms of farm management

According to 1973 statistics, there are 600 farm households in Yamagata growing a total of 35 ha of safflower. The average per household is thus small-6 acres per household, indicating that the predominant form is very small-scale cultivation. In 1973, average harvest was 12 kg per 10 ares ; this amount had a market value of 98,000 yen (\$ 350). However, that year, the average household gross income from safflower was only 45,000 yen (\$ 160) ; furthermore, there were large differences in harvest among areas, and substantial differences in technical level of cultivation among cultivation.

Data in table 2 are anticipated costs and income per 10 kilograms of harvested safflower. with the rise in wages, fertilizers, pesticides, etc in recent year, profitability of crops may be thought to be decreasing, but in fact profitability of specialty crops remains relatively high. In the case of safflower cultivation in Yamagata, a further benefit is that harvest begins in early July, allowing time for a second planting of a different crop<sup>1)</sup>.

Despite this, problems remain, and efforts must



Table 2. Income and production cost of safflower in Yamagata Pref.<sup>1)</sup>

Harvest Price		cost							
Yields	Gross income	Seedling	Fertilizer	Chemical sprays	Fuels	Materials	Irrigation fees	Labor costs	Equipment repairs
kg 10	yen 80,500	600	3,286	1,366	5	926	1,840	5,100	1,631

  

Equipment loan repayment	Interest	Total	Net income	Value of labor per 1 day	Net income/Gross income	Required labor time
1,687	837	17,278	63,222	2,648	78.5%	hr 19.10

Table 3. Standard cultivation system of safflower in Yamagata Pref.<sup>5)</sup>

	Preparation of seed	Plowing, harrowing	Fertilizer application	Seeding	Thinning
cultivation practice	selection and disinfection of seeds	manure 1,500 kg calcium 150-300 kg	N : 8.0 kg P <sub>2</sub> O <sub>5</sub> : 10.0 K <sub>2</sub> O : 10.0	seeding rate 2-3 kg per ares. weedkiller spray	thinning rate 18-20 plants per 1 m <sup>2</sup>
optimum season	Late Mar. to Early Apr.	Late Mar. to Early Apr.	Late Mar. to Early Apr.	Late Mar. to Early Apr.	Early May to Late May

  

Additional fertilizer	Intertillage	Control of diseases, insects	Flower pinching, preparation, drying	Packing, shipment
applied along one side of ridge lightly apart from base of stalk when plant has about 6-7 adult leaves	two times	<i>Anthracnose</i> Aphis	optimum season	one package per 2 kg
Early May to Late May	Early June	Middle June to Late June	Middle July to Late July	Late July to Early Aug.

be made in a number of directions to improve cultivation and management conditions. These areas include :

- The scale of cultivation is very small, and fields are dispersed.
- A large amount of labor is required for harvest and processing. As table 3 indicates, fully 78% of total labor requirements go into harvest and post-harvest work. There is on-going research on mechanization, especially a mechanical harvester, but as yet there is no mechanized system<sup>5)</sup>. The development of this and reduction of necessary labor is necessary to any increase

in average per household acreage. It is an essential element in attempts at any form of group cultivation involving, for example household units of at least 10 ares and a group total of over 5 ha.

- A third problem area is that demand is limited, and uses of the safflower remain underdeveloped. Ultimately, large scale production and mechanization of safflower cultivation depends on an expansion of demand. This can be stimulated by improved crop quality, and grower organizations are working to raise this quality level.

### E. Grower organizations and marketing

A special feature of safflower cultivation in Yamagata is contract cultivation; at the present time, almost all the safflower production for dyes and cosmetics is under contract to the major cosmetics companies.

Contract cultivation began in 1965 with the formation of the prefecture Association of Safflower Grower Cooperatives. This association contracts with the buyer companies and then allots acreage quotas to its member area cooperatives. These cooperatives are voluntary organizations of growers, who jointly fill the quota allotted by the prefectural association. Under this association are 16 local cooperatives (in addition, there are several small-scale cooperatives independent of the association).

### F. Developments in safflower varieties.

At present, the predominant variety in Yamagata is the Mogami Benibana, a variety developed in 1968 at the Prefectural Agric. Exp. Sta.. However, harvest is made difficult by spines on the leaves of most varieties; recently, the Experimental Station developed a spineless safflower and this is now undergoing on-site commercial cultivation.

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## 山形県におけるベニバナ栽培

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### 摘 要

ベニバナは口紅や頬紅および天然染料などを得る特用作物として、古くからわが国で栽培されていた。化学染料の普及から染料としての需要がうすれ、特用作物としての地位も一時失なわれたが、最近では油料作物として、あるいは花卉としてもその見なおしがなされている。

本稿では、わが国への導入の経緯を簡単に示し、山形県におけるベニバナ栽培の現況について述べた。

食用油の自国生産量が少ないわが国では、油料作物としてのベニバナ栽培を真剣に検討すべきであり、と同時に、天然染料源としてのベニバナも貴重なものであり、ドライフラワー・鉢物など花卉としての利用面についてもさらに検討されなければならないと思う。