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## **Study of *Glycine max* Merr. on its Productions and Uses in Lashio Township**

Swe Mar Tin<sup>1</sup>, Thida Aung<sup>2</sup>, Kay Thi Aung<sup>3</sup> and Nang Mya Oo<sup>4</sup>

### **Abstract**

The local cultivar of soybean was sown at near the former Botany Department, Lashio University Campus in June, 2006. Morphological characters of the plant were identified and presented with plates. Preparations of soybean milk, tofu, soybean sauce, dry chips of fermented soybean, fermented soybean fleshy cakes and soybean sprouts were studied and interviewed at the home industries in Lashio area and presented the preparation stages with plates.

**Key words:** Amino acid, carbohydrate, coagulate, fungus, minerals nutrient

### **Introduction**

Soybean (Pe-boke) originated as domestic in the half of Northern China around the 11<sup>th</sup> Century BC. From there, it spread to Manchuria, Korea, Japan and the Soviet Union where the centuries long process of domestication took place. Soybeans were introduced from China, Japan and Korea to most of the South and South-East Asian countries.

Soybean seeds contain about 40% high quality proteins and about 20% oil. It is the richest source of vegetable protein, which contains almost all the essential amino acids. The oil obtained from soybean is of semi-drying in nature and is used in cooking. Green seeds are occasionally used as vegetable. Seeds also used in preparation of certain confectionaries. Soybeans are used in the preparation of a variety of fresh, fermented and dried food products as milk, curd, tofu, soy sauce, bean sprouts, etc. They are neither used nor only for food but they serve also as a cure for various diseases and body ailments. Soybeans are medicinally used as to improve the action of the heart, liver, kidneys, stomach and bowels.

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## Materials and Methods

The local cultivar of soybean was sown at the South West Part of the front of Lashio University Campus near the former Botany Department in June, 2006 where the soil was sandy loam. First the soil was one deep plough followed by two to three cross harrowing and leveling for a good seedbed. In order to control seed and seedling rots, treat the seeds before the planting with fungicides. When the plants grown, they were given with the Cormet fungicides and fertilizers (Plate I, A, B).

The plants were harvested when the pods turned brown in colour and most of the leaves had dropped off. After being harvested, the plants were dried in the sun light and then the dried plants were threshed by beating with wooden sticks for taken the seeds. The seeds were stored and prepared for food as tofu, soybean milk, etc. Preparations of soybean milk, tofu, and soybean sauce, fermented soybean dry chips, fermented soybean fleshy cakes and soybean sprouts were studied and interviewed at the home industries in Lashio area.

Morphological characters of the plant and the observed preparation methods of soybean used as food were studied, identified, interviewed, recorded and presented with plates.

## Results and Findings

### Morphology

Myanmar Name	- Pe-boke
English Name	- Soybean; Soyabean
Scientific Name	- <i>Glycine max</i> (L.) Merr.
Synonym	- <i>Glycine soja</i> Sieb.
Family	- Fabaceae

Sub-erect, bushy, annual herb, pubescence, 1½ ft to 2ft in height. Leaves trifoliate, alternate, petiolate; leaflets ovate to lanceolate, entire, base rounded, acute to obtuse apex. Inflorescence axillary or terminal raceme with 3 to 30 flowers. Flowers small, bisexual, pappilionaceous, and irregular, pentamerous, hypogynous. Calyx (5), tubular with 2 upper and 3 lower unequal lobes, persistent. Corolla 5, keel shorter than wings, not fused along the sutures. Stamens 10, diadelphous. Style curved; stigma terminal and capitate; ovary sub-sessile. Pods slightly curved and

compressed, densely hairy. Seeds 1 to 3 or more in a pod, usually globose, yellow, green or brown in colour (Plate I, C, D).

### **Preparation of Soybean Milk**

The process consists of in steep the soybean seeds in water for over night (about 12 hours). Then the seed-coat are taken off by washing tap-water with plastic or bamboo sieve. After removing and cleaning, the seeds are soaked into the boiling water which add with 1:4 ratio of soda powder and water about 15 minutes for relieving the bean smell. Then the seeds are cleaning with cool water thoroughly and ground with mill-stone or machine (Plate I, E, F). The liquid are filtered by muslin cloth. The filtrate is boiled about 20 minutes. Then cooling down and taken as soybean milk (Plate I, G, H).

### **Preparation of Soybean Curd (Tofu-phyu)**

Soybean seeds are soaked in water about 8 hours and cleaned with water thoroughly. Then the seeds are ground by grinding machine or mill-stone and filtered the ground soybean by muslin cloth. The soybean filtrate is boiled and adds the filtrate of baked  $\text{CaSO}_4$  for the milk coagulating. The amount of adding the filtrate of baked  $\text{CaSO}_4$  is 0.25 liter per 1.6 kg of soybean seeds (Plate II, A, B). About 1 hour later, the coagulated milk is transferred into the wooden box which floor is placed with muslin cloth and covered it overlapping cloth (Plate II, C, D). Then pressed with the wooden lid and weight on the cloth. The pressed curd (tofu) are cut into cubes and taken as tofu.

### **Preparation of Soybean Sauce**

The starter culture for the production of soybean sauce is roasted the soybean seeds and next boiling with excess water and cool down. Then mixed with wheat flour when they cool, place in the flat trays and dry it in shade about 1 week and another about 1 week in sunshine. It is inoculated with fungal spores, treat as dry fermentation. After being dried and mixed with salt solution and set into the glazed earthen-ware jar. Amount of using salt for each glazed earthen-ware jar ratio is 5/8 tins per glazed earthen-ware jar of soybean. Then the mash with glazed earthen-ware jars are placed in the fully shine, as incubated for a period ranging for 10 weeks to over 1 year, depending on the temperature (Plate II, E, F). After these periods, the mash are extracted, filtered and boiled with wheat-bran (10 gallon per jar) and few brown sugarcane-slab until it is concentrated (Plate II, G, H).

Then cool it and filtered by a piece of muslin cloth (Plate III, A, B). The result of soybean sauce is filled in the bottle and takes as the commercial products (Plate III, C, D).

### **Preparation of Soybean Sprout**

First step of preparation of soybean sprout is selected the seeds, washed with water and dipped in the excess water about 8 hours. Then the seeds are washed and cleaned by water until seed-coats are removed. After cleaning, put into the wooden boxes or baskets which sited inside with banana leaves and then covered the lids to protect from light. And then given the water thoroughly as thrice a day (at noon, 6 PM and 3 AM) (Plate III, E, F). According to the temperature, after 3 to 6 days the seeds are germinated. At those germinating stages, taken out of the boxes or baskets and cleaned by water and then ready to use as food or as commercialized (Plate III, G, H).

### **Preparation of Fermented Soybean Dry Chips**

The soybean seeds are picked up the waste materials, washed and boiled with excess water until they are softened. After thorough draining and cooling, ground the soften seeds which mixed with the salt as necessary for tasty (often add chilies). Then taken the pulp to make chips (Plate IV, A, B). A few amount of soybean pulp are taken and pressed by hand using the Dauk-sat-pya leaves (*Solanum verbascifolium* L.). The chips are dried at the sun shine that placed on the bamboo trellis. According to the sunshine, after 2 to 3 days the chips are dried and preparing the packages for commercialized and storage as food (Plate IV, C, D).

### **Preparation of Fermented Soybean Fleshy Cakes**

The first stage of the preparation of fleshy fermented soybean cakes is choosing the waste materials which enclose with soybean seeds and placing in the excess water at about 8 hours. Then the soften seeds are drained and ground by the grinder as a machine or a mill-stone and filtered. The soybean filtrate is boiled and adds the filtrate of baked  $\text{CaSO}_4$  to coagulate the milk. After coagulated, placed in the tray, pressed with weight to lose the excess water and formed. Then they are cut into cubes at the size of about 1 inch x 1 inch. The soybean curd cubes are placed on the wooden or bamboo tray and stored at the room. According to the temperature, after 2 to 7 days, the curd cubes are inoculated with fungus (Plate IV, E, F). They are fermented in a mixture of 12% NaCl (salt), 10% ethanol and

mixed with ginger, chilies and spices as necessary for tasty. Then the tasty fermented soybean cakes are produced and the packages are prepared for commercialized and storage as food for a long time (Plate IV, G, H).



A



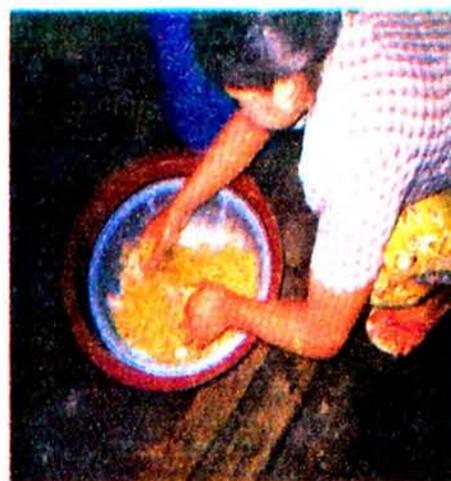
B



C



D



E



F



G



H

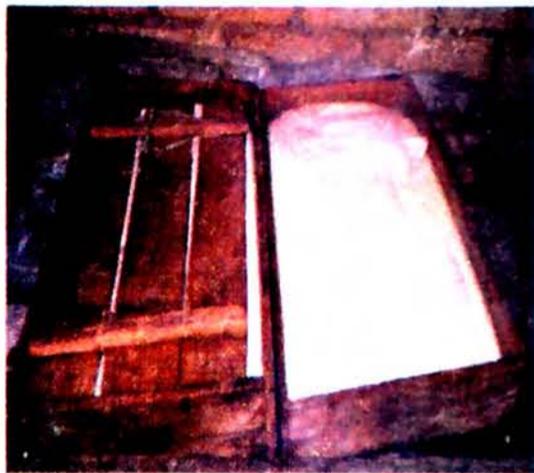
Plate I



A



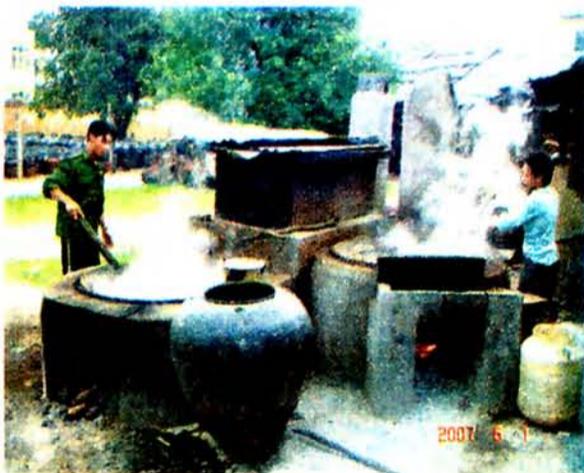
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C



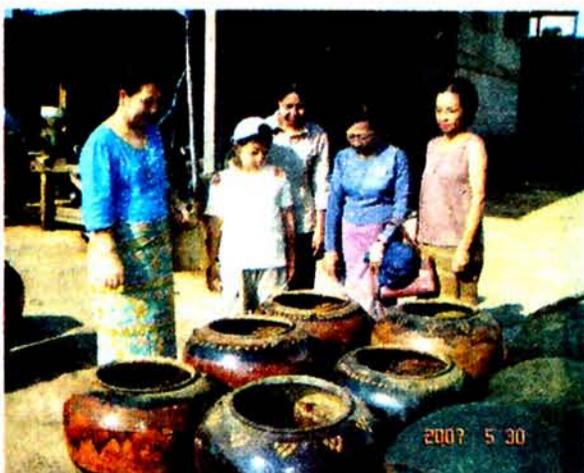
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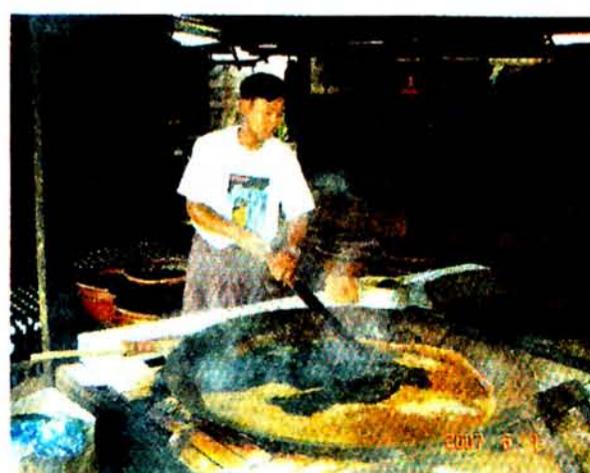
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G



H

Plate II



A



B



C



D



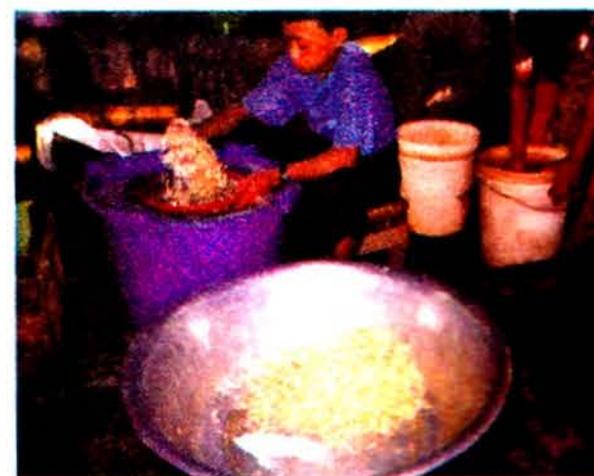
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F



G



H

Plate III



A



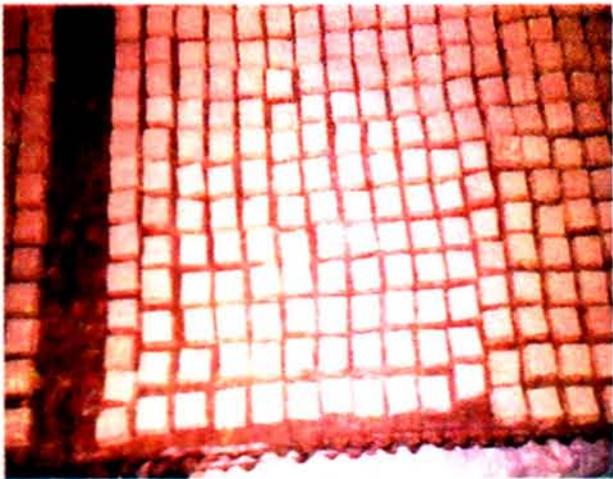
B



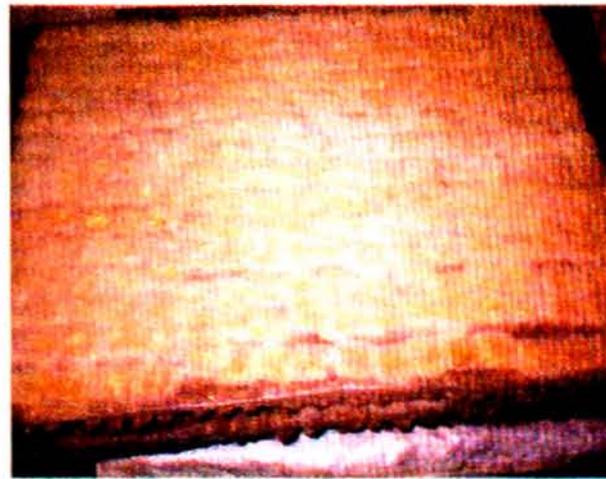
C



D



E



F



G



H

Plate IV

## Discussion and Conclusion

Soybean is an important legume crop in the Far East. The seed have been used for centuries as an article of food in China, Japan and Korea and constitute a valuable protein supplement to the rice diet. Other Asian countries in which soybean are grown to some extent is Philippines, Indonesia, Thailand and India. In recent years, it has attained great importance in U.S.A. as a raw material for industry and its cultivation has been greatly extended.

*Glycine max* (soybean) is essentially a sub-tropical plant. Its cultivation extends to tropical and temperate regions. Numerous forms differing in cultural and botanical characteristics exist. The plants grow best on rich sandy or clayey loams or well-drained alluvial soils. It can grow in acid as well as in neutral or alkaline soils. In acid soils, it responds to the application of lime. When grown on productive soils, the application of nitrogenous fertilizers is not necessary, as it is capable of utilizing atmospheric nitrogen through the agency of bacteria present in its root nodules. On soils of low fertility, application of leaf mould or farmyard manure ensures good crops. Specific bacteria are involved in nitrogen fixation and in soils where such bacteria are not present, soybean crops fail unless nitrogenous fertilizers are applied.

Soybeans are propagated by seed. They are cultivated both as a sole crop and in various intercropping systems with maize, sunflower, fruit-trees, etc. Soybeans are grown on paddy-rice bunds too. Weed control is essential. At flowering stage and during seed filling, irrigation is essential to gain optimum yield. More frequent irrigation is needed in sandy well drained soils than in heavy clay soils (Myanmar Agricultural Department).

Soybean is apparently sensitive to changes of soil and climate, and the same type grown in different localities often exhibits striking differences in behaviour. According to the period of maturation of crops, soybean types have been classified into early (thet-lyin), medium (thet-latt) and late (thet-kye) types. Myanmar Agricultural Department stated that it is also termed as Yezin 1 (thet-kye), Yezin 2 (thet-latt) and Yezin 3 (thet-lyin) in Myanmar. It is generally sown at the outbreak of the monsoon in June or July. Early maturation cultivars can be harvested for seeds 75 to 90 days after planting and late maturation cultivars need up to about 110 days. When it is grown for seeds, the crop is harvested when the leaves begin to fall off and the pods are just ripe. If the pods are allowed to become too

ripe, they burst open and considerable loss of seed results. When it is grown for green manure, the plants are ploughed at the blooming stage. At this stage the nitrogen content of the plant is high.

According to Myanmar Agricultural Department, the annual area under soybean (*Glycine max* L.) in Myanmar is about 281,616 acres and producing about 108,500 metric tons (2000-2001). The majority of the soybean area about 50% is in Shan State and the remaining is grown in Mandalay, Sagaing, Ayeyarwady, Bago Division and Kachin State. In lower Myanmar, it is also grown on alluvial soils of inundated areas as winter crops when the water has receded.

Soybean seeds are the most nutritious food. It is rich in proteins, calcium, iron and vitamins (Pandey, 2000). The protein presents in raw or unprocessed seeds has low digestibility and biological values. The protein in the seed is enclosed in a cellulose envelope which prevents the digestive fluids from readily acting on the protein. The raw bean contains a heat-labile trypsin inhibitor which affects the utilization of protein by the organism. The inhibitor is destroyed or inactivated by cooking or autoclaving and processed soybean possesses high nutritional value.

Soybean after processing by heat treatment or germination to render the nutrients available is consumed in the form of flour, milk, curd, sprouted beans and other fermented products. Soybean flour is prepared from high quality yellow beans. It is cream yellow in colour with nutty taste. The milk has a pale yellow colour, nutty flavour and agreeable taste and it is reported to compare with cow's milk in nutritive value. The digestibility coefficient and biological value of the proteins of soymilk are 90 and 81 respectively. Soy milk is of particular value in cases of milk allergy and in special diets. The meal left after the extraction of milk is used in food and as a fertilizer for maintaining and improving the fertility of the soil. It has a sweet nutty flavour and it is relished by livestock and poultry. Sprouted soybean is used as green vegetable and is reported to possess high nutritional value.

Because of their great nutritional value and application of fertilizer, improved cultivars are expected to increase and stabilized yield, improved resistance to diseases and pests, improvement in nutritional quality and identification of appropriate management practices to exploit the maximum economic yield potential of cultivars should be given priority (Vander, 1992).

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