

Breeding of Konnyaku in Japan

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General situation on Konnyaku cultivation

Though many plants of genus *Amorphophallus* distribute in the tropical regions of Asia and Africa, they had not been cultivated as an economic crop in these areas except in Japan.

It is believed that Konnyaku was brought to Japan from Southeast Asia at the time of the introduction of Buddhism.

Since ancient days, Japanese relished the processed Konnyaku as a unique food.

Konnyaku cultivation spread all over the country in the 1770s when the preservation and transportation of products were practical by the invention of milling.

The history of the cultivation before this period is almost unknown.

The yearly output of Konnyaku in Japan amounted to 70,000 tons before World War II and most of the yield was produced in the Kinki districts and westward. But after the war, the producing center was transferred eastward and production increased greatly reaching 130,000 tons in 1967, more than 60 per cent of this amount being turned out in north Kantô and south Tôhoku area.

Although the cultivation areas are distributed from the north (Tôhoku) to the south (Kyûshû), Konnyaku is grown almost always on mountainous lands which are not favorable for general crops. This is due to the poor summer climate of plain fields which induce disease injury for growing Konnyaku.

Konnyaku is a perennial summer crop. The seed corm is planted in May and yield in October or in November. The planted corm grows and produces several daughter corms. The yielded grown-up corms are sent to market either as raw flour or in unprocessed form but the young corms and daughter corms are reserved as seed corms for next year under room temperature during winter.

Though it has been desired to avoid continuous cropping of Konnyaku owing to its susceptibility to injury caused by disease and continuous cropping, the performance of crop rotation has become rather difficult because of augmented cultivation areas.

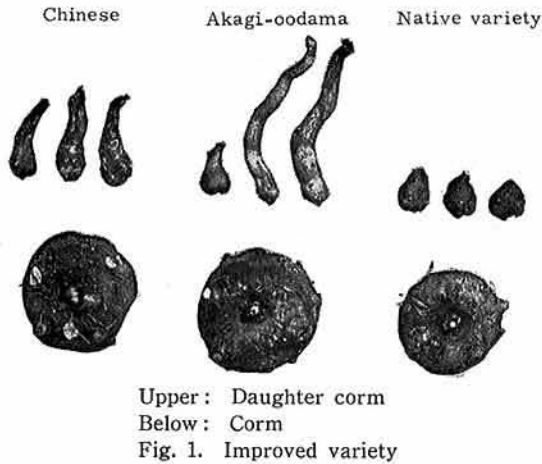
Konnyaku cultivation of Japan

Konnyaku had been cultivated intensively by small scale farming restricted by various characters and field conditions. But recently, due to the improved agricultural situation, labor-saving cultivation and expansion of farming scale have been pushed to elevate labor productivity and to increase the cultivation area in uplands or in paddy fields.

Therefore, disease resistance, adaptability for mechanical cultivation and reproductive ability were required as well as productivity and good quality for the breeding of variety to modernize Konnyaku cultivation.

1) Disease resistant variety

Despite the progress of labor-saving cultivation, manual labor is still necessary to carry out planting, yield and preservation of seed



corms and 150 working hours are needed per 10 areas.

The main trouble which hinders the progress of mechanization and labor saving is the susceptibility of Konnyaku to many diseases, especially to decay soft rot and dry rot caused by mechanical epidermal damage. Thus, the production of Konnyaku in many prefectures is hit by these diseases and a huge amount of labor and expense is needed to prevent the spread of disease.

As for the breeding of disease-resistant variety, the effect of mutation is greatly anticipated because the genes of Konnyaku are difficult to catch.

On the other hand, it may be effective to avoid rotting or dry rot by using the strong variety against mechanical damage, that is, the adaptable variety for mechanical cultivation.

2) Variety contains high mannan

Konnyaku is widely consumed as food in Japan and it is usually processed, utilizing the glutinous character of mannan which is its principal ingredients; therefore, the evaluation of corms is determined mainly by the amount and glutinous character of the mannan contained.

Mannan content increases generally according to the growth in volume of corm but water content is also augmented in this case. Consequently, mannan percentage is forced to decrease.

The bred variety of high yield and of good quality has good amount and quality of mannan, but the low percentage of mannan caused by high water content has degraded the quality of corms.

High water content is also not favorable for the preservation, transportation and processing of corms.

Therefore, it is essential to breed the variety of high growth in volume and high percentage of mannan content.

3) Reproductive variety

Konnyaku has been reproduced by vegetative propagation with daughter corms. Seed propagation has been used only for breeding because Konnyaku varieties are employed to reveal high hybridity.

As young corms cannot produce many daughter corms, biennial or triennial seed corms must be planted besides the daughter corms to maintain yearly the yield of settled



Fig. 2. Cultivation

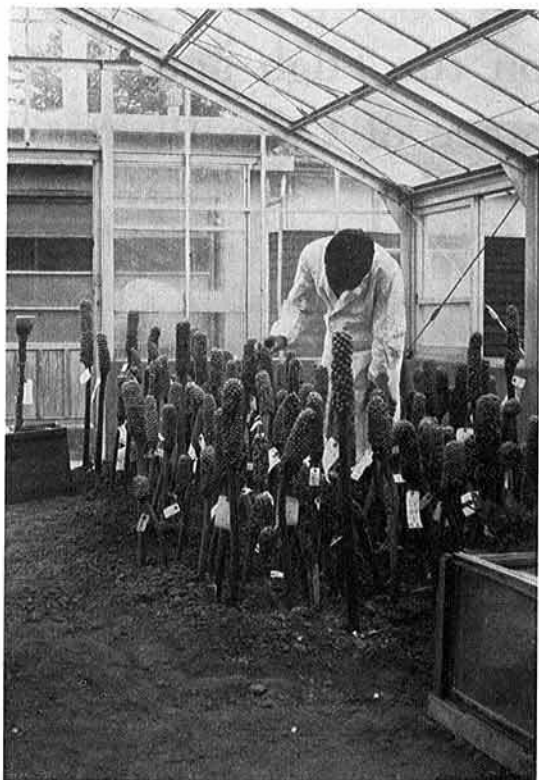


Fig. 3. Fruits

standard.

Thus, Konnyaku cultivation takes years, hence interest from investment is apt to decrease and the risk of damage for cultivation may be naturally increased. In short, it is important to shorten the years for breeding the variety of high-growth ability and high reproductivity.

Breeding of Konnyaku in Japan

The Hiroshima Agricultural Experiment Station had bred Hiroshima select breed by

selection method many years ago. However, it was not accepted as a new cultivar of Konnyaku because its improvement possibility in terms of clonal separation was very low.

The Ministry of Agriculture and Forestry designated an experimental field of Konnyaku at the Gunma Agricultural Experiment Station in 1946 to develop upland field farming of the country. The breeding of Konnyaku started there as a division of disease control and it has gradually made rapid progress since 1955.

Then a series of breeding works, that is, hybridization, seedling cultivation, pedigree selection, test for physiological character and adaptability test of strains, has been promoted in this field with the object to improve Konnyaku cultivars in Japan.

The Fukushima Horticultural Experiment Station took partial charge of the adaptability test of strains since 1972.

The principal breeding method in this experimental field of the Gunma Agricultural Experiment Station is hybridization.

HARUNA-KURO and AKAGI-ODAMA are the cultivars selected by means of varietal cross in this field.

Since the range of variation in varietal cross is not so large, other breeding methods—interspecies crossing with wild species, utilization of heterosis in self blending, radiation breeding and induced mutation by chemicals—are expected very much in the future.

Furthermore, the fundamental studies of genetics, physiology and ecology are essential to carry out these breeding methods efficiently.