

特別講演要旨

Recent Development in Rice Seedling Raising in Japan,
with Special Reference to the "Nursling Seedlings" (Nyubyo)

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Abstract

Mechanical transplanting in Japan's rice cultivation has been presently spread all over the country. When this technique was first employed about 3-leaved seedlings, which are called "Chibyō" were used. However, Chibyō are so young and small compared to the former hand-planted more mature seedlings with 6 or 7 leaves, that farmers felt uneasy about mechanical transplanting and the resulting yield. They were also afraid that a delay might occur in the heading date in northern and mountainous regions. Accordingly, more advanced seedlings with 4 or 5 leaves, which is called "Chubyō" or "middle seedling" had been used in the mechanical transplanting. At present, Chubyō has been increased to 35% of all area of Japan's paddy field.

Industrial development in Japan has absorbed massive labor from agriculture which resulted in a trend that the labor in rice cultivation is composed largely of elderly people. This brought about the present situation in which seedling raising of rice becomes the task of aged people and women. A striking tendency subsequently comes into existence in the simplification of the techniques of seedling raising. This simplification, unfortunately, has accompanied with another severe problems, namely, the increase in production costs of rice cultivation.

At present, due to the surplus of rice which results in a reduction in the price of rice products, and a increased pressure for free trade in rice, it

becomes a large challenge in rice cultivation to lower the production costs as much as possible.

Efforts aimed at mechanical transplanting of seedlings younger than Chibyō have been attempted for nearly 10 years by Japanese researchers. If the seedling raising period can be shortened labor and material inputs could be reduced. Dense seeding and the reduction in the number of nursery boxes can also be achieved if the seedlings are small. Research aimed to realize these methods are fortunately under rapid development.

The seedlings younger than Chibyō have the draw back that their root spread into the bed soil is too weak to be used for mechanical transplanting because of the absence of interlocking roots which result from the undevelopment of crown roots. Employment of a specialized nursery mat made from rock wool by Nippon Steel Chemical Co. Ltd. can produce root spread into the mat much stronger, which leads to the realization of mechanical transplanting of the younger seedlings with the ordinary transplanting machines already employed in the transplanting of Chibyō and Chubyō.

The seedlings younger than Chibyō were defined in 1990 by the Ministry of Agriculture, Forestry and Fisheries as the "Nyubyō". Consequently, it becomes possible, to achieve economic profits from the reduction in both working time and costs as compared to that in using either Chibyō or Chubyō. The nursling seedlings are therefore being widely noticed as a strategy to solve the difficulties in current rice cultivation.

The term "Nursling seedlings" named in English by the present author is defined as the seedlings between 1.4 to 2.5 leaves with an average of 2.0 leaves and height at 4.5 to 7 cm, grown 4 to 7 days after seeding. This kind of seedling maintains still up to 50 to 80% of their nutrients in the endosperm, and they can maintain their growth using only their own nutrients for a certain period of time after transplanting.

Nursery period with the nursling seedlings is short. It takes 2 days in the nursery chamber at 32°C after seeding, and 2 days in the

greening house at 25°C. This is only 4 days, all together, to make the nursling seedlings of 1.5 leaves which are ready for transplanting.

It requires less labor to make the nursling seedlings because of the shortened of nursing period. Another advantage is that the beginning of the nursery work can be delayed compared to that in the Chibyo.

The number of nursery boxes can be reduced because it is possible to sow more densely (220 to 240 g per box), thus it only needs seedlings of 15 to 18 boxes, per 10 a which leads to a reduction in facilities and space needed.

Temperature during the nursery period can be artificially adjusted more precisely which may lead to the prevention of temperature stress.

Watering is only needed once at the sowing time. It only takes 1 or 2 waterings even to raise a seedlings for a period of 7 days.

The advantages of an ultra-short raising period of the nursling seedlings can also be revealed. Besides those stated above, it reduces the overlap between the raising of the seedlings and other agricultural activities.

The nursling seedlings are characterized by a rapid rooting. After transplanting, crown roots from the coleoptile node begin to emerge immediately, and this results in the rapid rooting of the seedlings.

The nursling seedlings show strong resistance to low temperature and deep-planting. There is no danger in the rooting of the seedlings even if half of their height is buried into the soil. Moreover, it can root at a rate of up to 65 to 80% even if the full height of the seedlings is buried.

The nursling seedlings show also strong resistance to submergence. They can reach the status of rooting and break to emerge from irrigated submergence even if it is transplanted to a depth of 10 to 15 cm.

The nursling seedlings tend to grow by producing tillers from lower(basal) nodes. It is therefore necessary to control the production of early tillers in order to keep the proper numbers of tillers per unit area.

There is no fear in the delay of heading in plants grown from the nursling seedlings. Their yield components can be well balanced since the number of

panicles can be kept higher which compensates for the small size of panicles resulting from the existence of a little too many tillers in a single hill. The same level of yield was achieved with the nursling seedlings compared to that with Chibyoo or Chubyoo. It was further suggested that if the surplus tillers can be avoided by such cultivation practices, as deep irrigation, the number of grain per panicle can be kept greater, and higher yield can be realized.

Practical experiments with the nursling seedlings conducted in 1989 and 1990 by farmers in various areas showed exciting results. Yield reduction with the nursling seedlings were rarely found in these years.

The nursery techniques with the nursling seedlings are still under investigations from various aspects. Further approaches to practical techniques in the paddy fields, such as the problem of using herbicides and pesticides, etc., should also be carried out.

Considering that both Japan and Korea are advancing in the same way to the relationship between industry and agriculture, I would predict that along with the development of mechanical transplanting and the need to lower production costs in Korea, rice cultivation with the nursling seedlings will become widely spread, or at least occupy an important position in rice cultivation techniques, of your country. I sincerely hope that my information about one of the newest rice cultivation techniques in Japan, the employment of nursling seedlings, can be of some value to Korean crop scientists and farmers.