Physiological Character of Rice Seedlings (III)*

Yasuo ŌTA and Noboru YAMADA

(National Institute of Agricultural Sciences)

It was already reported by the authors^{3,4)} that upland seedlings of rice possess higher activity of rooting and consequently show much better growth after transplanted than lowland seedlings. In the present paper the growth, chemical composition, and absorption of nutrients during the early stage of paddy field period are compared in details between upland and lowland seedlings under moderate and low temperature conditions in order to ascertain the superiority in growth of the upland seedlings under low temperature.^{1,2)} The plants grown from the upland seedling

air temperature was controlled to be moderate or lower. The plants were grown for thirty days under the conditions. Trend of daily mean air temperature in both glasshouse is shown in Fig. 1.

Results and discussion

1) **Growth of plants:** Plant height and dry weight of plant are shown in Fig. 2. It is clearly observed that the growth of the upland seeded plants is much better than that of lowland-seeded plants, especially under low temperature.

2) **Nitrogen and carbohydrate content:** Nitrogen content and amount of nitrogen contained per plant are shown in Fig. 3.

Nitrogen content is, in general, slightly higher with the upland seeded plants than with lowland one, growing under the respective temperature.

The most interesting difference is observed in the carbohydrates content in plants. As

Fig. 1 Daily mean air temperature of two plots.

and lowland seedlings are referred to upland-seeded plants and lowland-seeded plants respectively.

Variety, Norin No. 8 was shown on the 15th of May on the upland and lowland nursery bed, and on the 1st of July the seedlings were transplanted, after selected for uniformity, in the pots (1/50000 Tan size) containing paddy field soil.

The pots were separated into two groups, each of them was placed in the glasshouse where the

Fig. 2 Growth of plants in height and dry weight illustrated in Fig. 4, the upland-seeded plants contain larger amount of starch and total sugars than the lowland one. In the upland-seeded plants starch and total sugars occupy the greater proportion in the total carbohydrates.

This property is similar to that observed during the seedling stage at the nursery bed³⁾. This characteristic difference is also observed in the amount of starch and total sugars per plant, as shown in Fig. 5.

Another interesting difference in the carbohydrates content is recognized between different temperature plots. Under low temperature much more portion of the carbohydrates produced by photosynthesis is accumulated in the form of starch and sugars, so that the proportion of them to the total carbohydrates is higher with plants grown under low temperature. This must be

Fig. 3 Nitrogen content (N mg/g. dry weight) and amount of nitrogen per plant.

* Presented on the 119th Meeting of the Crop Science Society of Japan. 9th, Apr. 1958.

Fig. 4 Carbohydrate content of plants (glucose mg/g. dry weight)

 Fig. 5 Amount of carbohydrate per plant.
(as glucose mg/plant)

ultimately owing to the fact that less carbohydrate is consumed to make up cell wall constituents.

matter than lowland one, and it is remarkable especially under low temperature. The nutrients absorbed by the upland-seed plants with much higher rate than the rate of upland-seeded plants against the lowland ones in the dry matter increase under low temperature are manganese, nitrogen, phosphorus, potassium and iron.

This indicates that the upland-seeded plants possess a high ability to absorb these nutrients under low temperature. On the other hand, under relatively high temperature condition only slight difference is observed between the rate of the upland-seeded plants to the lowland one in dry matter increase and that in the nutrient absorption. But manganese and potassium are absorbed with higher rate by the upland-seeded plants than the lowland-seeded plants, indicating that the upland-seeded plants possess higher ability to absorb these nutrients even under high temperature condition.

These results lead to the conclusion that the upland seedlings have advantage of assuring

Table. 1 Increase of top dry weight and of nutrients absorbed during experiment period (mg/plant).

Expt. Plot	Seedling	Top dry weight	Total-N	Total-Carbohydrates	Phosphorus	Potassium	Iron	Manganese
Low Temp.	Lowland Seedling	78.0 (100)	2.209 (100)	18.018 (100)	0.524 (100)	3.193 (100)	0.155 (100)	0.554 (100)
	Upland Seedling	306.0 (388)	10.779 (488)	41.932 (233)	2.448 (468)	14.504 (455)	0.684 (440)	3.630 (655)
Moderate Temp.	Lowland Seedling	643.3 (100)	20.426 (100)	94.881 (100)	6.247 (100)	24.222 (100)	1.279 (100)	8.395 (100)
	Upland Seedling	894.0 (139)	26.516 (130)	123.431 (130)	7.751 (124)	48.316 (198)	1.379 (108)	17.032 (202)

Note : Figures in the parenthesis indicate the ratio of upland seedlings to the lowland seedlings, taking the value of the lowland seedlings as 100.

better initial growth in the early transplanting at cooler regions, or in the particular ill-drained paddy field where the initial growth of transplanted seedlings is apt to be hindered.

Literature

- 1) AIMI, R. & H. NAKAMURA : Proc. Crop.

Sci. Society, Japan, 26 (2), 1957.

- 2) HIRANO, T., ONODERA, S. & T. TAKEMURA : *ibid*, 26 (3), 1956.

- 3) YAMADA, N. & Y. ŌTA : *ibid*, 25 (3) 1957.

- 4) ———, & ——— : *ibid*, 26 (2) 1957.

(和 文 摘 要)

水 稻 苗 の 素 質 に 関 す る 研 究 (第3報)

太 田 保 夫・山 田 登

(農業技術研究所生理遺伝部)

水稻農林8号を水苗代及び畑苗代で育苗し、7月1日ポットに移植し、その後30日間に亘つて第1図に示すごとき室温の硝子室内で生育せしめた。畑苗の生育は低温区に於て特に水苗より勝り、体内炭水化物含量について興味ある特長を示す(第4図)。すなわち畑苗は澱粉及び全糖の含量が高く、全炭水化物中でこれら成分の占める割合が高い。水苗、畑苗を問わず低温区では全炭水化物中で澱粉及び全糖の占める割合が高く、温度によるこの差異は寒地と暖地に生育する水稻の炭水化物成分含量にちがいのあることを示している。実験期間中に水稻体によつて吸収された二、三無機成分の量を第1表に示すが、それによれば畑苗は水苗に較べて甚だ多量の吸収を行つている。もとより乾物重の増加が畑苗に於て著しく大であるから、このことは当然であると考えられるが、しかしマンガン、窒素、磷酸、加里、鉄は低温区に於て水苗に対する畑苗の乾物重の割合よりさらに著しく高い割合で吸収されており、畑苗は低温下に於てこれら成分の吸収力が高いことを示している。高温区では水苗に対する畑苗のこれら成分の吸収量の比率と、乾物重の比率との間に大きな差異がないが、しかしこの場合にも加里及びマンガンの吸収量の比率は乾物重の比率より高く、高温に於ても畑苗はこれら成分の吸収が水苗より高いことを示す。畑苗のこの性質は寒地に於ける早植栽培に役立つているが、初期生育の不良になり勝ちな湿田に於ても有効であろうと考えられる。