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Effect of Seedling Age on Internode Elongation of Rice Plant

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水稻의 苗垈日數가 節間伸長에 미치는 影響

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ABSTRACT

Three different improved pre-release rice varieties, when transplanted at different ages of seedlings, showed that 40 day old seedlings produced the longest panicle, whereas 30 day old seedlings produced the highest culm length among treatments in all treated varieties. 40 day or older seedlings reduced the culm length remarkably mainly due to decrease in lower internodes in IET7251 and BG400-1, and due to upper as well as lower internodes in B44b-50-2-2-5-1. 30 day old seedlings produced maximum number of visible internodes. Heading as well as maturity was delayed with increasing age of seedling.

INTRODUCTION

Out of 1.334 million hectares of rice field of Nepal only 0.2724 million hectares(20.42%)is under irrigated conditon; the rest falls under the rainfed condition, and transplanting of rice seedlings depends on the onset of the monsoon rain which is unpredictable. Therefore, the optimum age of the rice seedlings is rather guided by the onset of the monsoon rain. It has been generally observed that farmers specially in the Tarai region (Southern plain area with subtropical climate) of the country have been able to obtain satisfactory rice grain yield even when transplanted with older rice seedlings of more than two months in local late maturing (photo-period sensitive) rice varieties. Around 25 day old seedlings are generally recomended for transplanting in this region. Shrestha [6] found no significant reduction in grain yield as well as plant height when transplanted upto 55 day old seedlings of local photo-period sensitive rice variety of Nantuni. Mallick and Singh[2] reported that even 61 day old seedlings of Handifool, a strongly photo-period sensitive variety, and Masuli, a weekly photo-period sensitive variety, produced satisfactory grain yield without any significant decrease. However, they found that the age of seedling was a significant factor in early maturing photo-period nonsensitive varieties, and transplanting with increasingly older seedlings delayed maturity, and had adversely affected grain yield in such varieties. Giri and Singh[1] and Mathema[3] also found same type of results in differences in age of seedlings. So far, there is no report on the effect of age of seedlings on internode elongation system under the field condition of Tarai, Nepal. The internode elongation system of the rice plant is also affected very much by the external GA3 application as well as different day-length conditions (Shrestha[4,5]). The main objective of this experiment is to find out the effect of age of

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seedling on the internode elongation system of the rice plant.

MATERIALS AND METHODS

Three promising pre-release rice varieties viz IET-2751, BG400-1 (OB678//IR20/H4) and B44b-50-2-2-5-1 (PB5/Syntha) for the Tarai region of Nepal were seeded on June 5, 1984, and transplanted in different dates at an interval of 10 days as shown in Table 1. This experiment was conducted under Parwanipur (27°04'N and 115 meter altitude) field condition with two seedlings/hill at 20cm by 20cm spacing under optimum cultural practices with three replications. IET7251 is a weekly photo-period sensitive and tall rice variety that matures in around 150 days in this region when transplanted in the month of June-July. B44b and BG400-1 are medium maturing pre-release varieties that perform better in this region. Ten main tillers were sampled from each treatment from three replications at maturity and observations were taken on heading, maturity, panicle length, culm length, number of visible internodes and length of all the visible internodes. Data are presented in Table 1, and 2.

Table 1. Number of days to heading and maturity of different rice varieties transplanted at different ages of seedlings.

Variety / Planting date		IET7251		BG400-1		B44b-50-2-2-5-1	
Seeding	Transplanting	Days to Heading	Days to Maturity	Days to Heading	Days to Maturity	Days to Heading	Days to Maturity
June 5,	1. June 15	115	142	114	140	117	144
	2. June 25	118	144	117	141	114	144
	3. July 5	119	145	115	146	118	146
	4. July 15	117	149	118	149	119	147
	5. July 25	120	152	124	150	124	156
	6. August 4	124	156	126	157	126	157

RESULTS AND DISCUSSION

Effect of age of seedlings on maturity, panicle length and culm length.

Observations on effect of different ages of seedlings indicated that the younger seedlings headed and matured earlier in all the treated rice varieties as shown in Table 1. 10 day old seedlings of IET7251 matured within 142, whereas 60 day old seedlings matured in around 156 days. Similar tendency was shown by other two varieties also. Transplanting of upto 30 day old seedlings showed shorter panicle lengths in all the treated three rice varieties as compared with 40 day old ones, and older seedlings of 50 days or more produced shorter panicles. However, the increase or decrease in panicle length at different ages of rice seedlings was not significant as shown in Table 2. Maximum culm length was observed at 30 day old seedlings in all three treated rice varieties. Older seedlings of 40 days or more produced shorter culm lengths, and the 60 day old seedlings produced the shortest culm lengths among treatments in all varieties. IET7251 produced the longest culm length of 106.2cm when 30 day old seedlings were transplanted, and 60 day old seedlings produced the shortest culm length of 80.8cm among treatments. There is no remarkable difference between the culm lengths of 10, 20 and 30 day old seedlings. Similar effect of age of seedlings on culm length was found in BG400-1 and B44b. BG400-1 produced the lengest culm length of 85.2cm when 30 day old seedlings were transplanted, and the shortest culm length of 68.8cm was produced by the 60 day old seedlings as shown in Table 2 and Figure 1. B44b produced the longest culm length of 71.9cm when 30 day old

seedlings were transplanted, and the 60 day old seedlings produced the shortest culm length of 56.65cm. Similarly, 30 day old seedlings produced the maximum number of visible internodes, and the minimum number of visible internodes were produced by 60 day old seedlings in all the treated varieties. IET-7251 produced the maximum number of 7.9 internodes when 30 day old seedlings were transplanted, and the 60 day old seedlings produced the minimum number of 5.0 visible internodes as shown in Table 2. The 6th internode shown in Figure 2 is the cumulative invisible internodes. 30 day old seedlings of BG400-1 produced the maximum number of 9.1 visible internodes, and the 60 day old seedlings produced the minimum number of 6.4 visible internodes. Similarly, 30 day old seedlings of B44b produced the maximum number of 10.2 visible internodes whereas the 60 day old seedlings produced the minimum number of 6.9 visible internodes. However, there is no any remarkable difference in number of visible internodes between 10, 20 and 30 day old seedlings in all the treated varieties as shown in table 2.

Table 2. Plant height and number of visible internodes in rice plant transplanted at different seedling ages under Parwanipur field condition (1984).

Age of seedling (days)	10	20	30	40	50	60	Mean
Character							
Panicle length(cm)							
IET7251	21.20	21.90	23.15	24.70	23.30	24.40	23.19
BG400-1	21.60	21.05	22.50	23.10	22.35	23.00	22.30
B44b-50-2-2-5-1	25.30	25.15	26.45	26.60	26.15	25.60	25.88
Culm length(cm)							
IEY7251	104.15	105.40	106.20	96.75	85.35	80.80	96.78
BG400-1	81.60	81.45	85.20	77.80	77.40	68.25	78.53
B44b-50-2-2-5-1	68.35	69.15	71.90	65.75	63.35	56.65	66.53
Number of visible internodes							
IET7251	7.0	7.8	7.9	7.7	5.9	5.0	7.3
BG400-1	8.5	8.7	9.1	8.2	7.8	6.4	8.1
B44b-50-2-2-5-1	8.7	9.4	10.2	9.4	8.7	6.9	8.9

Effect of age of seedling on internode elongation:

Figure 1 shows that 30 day old seedlings produced the longest culm lengths in all the treated rice varieties, and there is no remarkable difference in total culm lengths between 10, 20 and 30 day old seedlings. The culm length decreased remarkably with the older seedlings of 40 day or more, and the 60 day old seedlings produced the shortest culm length in all treated rice varieties. Seedlings of upto 30 days old showed nearly same length of internodes upto third ones or even lower internodes. 40 days or older seedlings showed remarkable decrease in total culm length mainly because of the reduction in lower internode length as shown in Figure 2. IET7251 produced the first longest culm length of 35.7cm with 30 day old seedlings, and the shortest length of 32.55cm with 50 day old seedlings. Similarly, the longest second internode was produced by 20 day old seedling with 23.25cm, and the shortest second internode of 21.2cm was produced by 60 day old seedling. The 4th, 5th and lower internodes showed remarkable decrease in length with increasingly older seedlings as shown in Figure 2. In the same way, 30 day old seedlings of BG400-1 produced the longest first internode of 36.25cm and the shortest first internode of 32.0cm was produced by 60 day old seedling indicating that there was no remarkable difference between the longest and the shortest internodes among the treatments in BG400-1. Such trend was also observed in 2nd, 3rd and 4th internodes. In case of B44b the difference between the longest and

the shortest first internodes among treatments was 4.15cm, the longest one being 31.6cm from the 30 day old seedling and the shortest one being 27.45cm from 60 day old seedling. This trend was observed in the 2nd, 3rd and lower internodes also as shown in Figure 2.

All the treated rice varieties in this experiment showed delayed maturity with increasingly older seedlings. Shrestha[6] found earlier maturity with increasingly older seedling transplanting with Nanturi rice variety. Mallick and Singh[2], however, found same days to maturity with different age of seedlings in Handifool rice variety whereas in Masuli variety they found delayed maturity with increasingly older seedlings. Sankharika, a strictly nonphotoperiod sensitive local rice variety also showed the same tendency as by Masuli in the same experiment. This experiment shows that medium maturing rice varieties delayed maturity with increasingly older seedlings. 40 day old seedlings of all treated rice varieties produced the longest panicles in this experiment, whereas, Shrestha[6] found the longest panicle in the 10 day old seedlings, and the older seedlings produced significantly shorter panicles. This result indicates that 10 to 30 day old seedlings produced nearly same length of the culm although the longest culm length was found in 30 day old seedlings in all the treated rice varieties. The same phenomenon was reported by Shrestha[6]. In many semi-dwarf rice varieties 50 PPM external GA3 applied around ear primordia initiation stage showed maximum elongation of culm length (Shrestha. 1980.)[6] Shresita also found the maximum increase in total culm length under 24 hour daylength condition in rice. In this experiment 30 day old seedlings could produce the longest culm length in all treated rice varieties with strong indication that the maximum synthesis of endogenous plant growth hormones like GA3 could take place in around 30 day old condition under Parwanipur field condition. Decrease in total culm

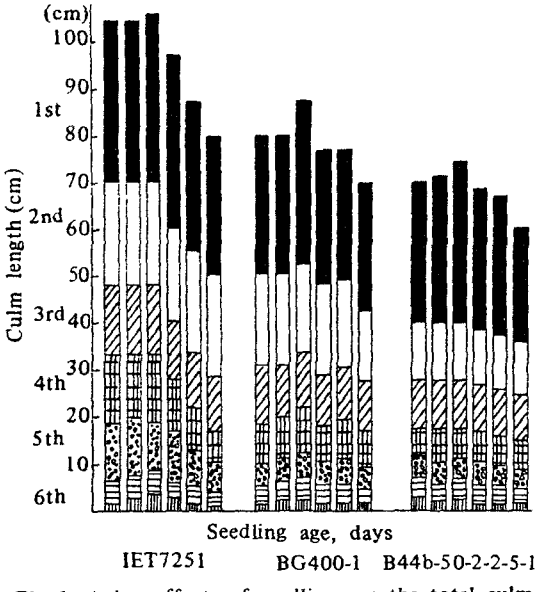

Fig. 1. Aging effects of seedlings on the total culm length under Parwanipur field condition. 1984.

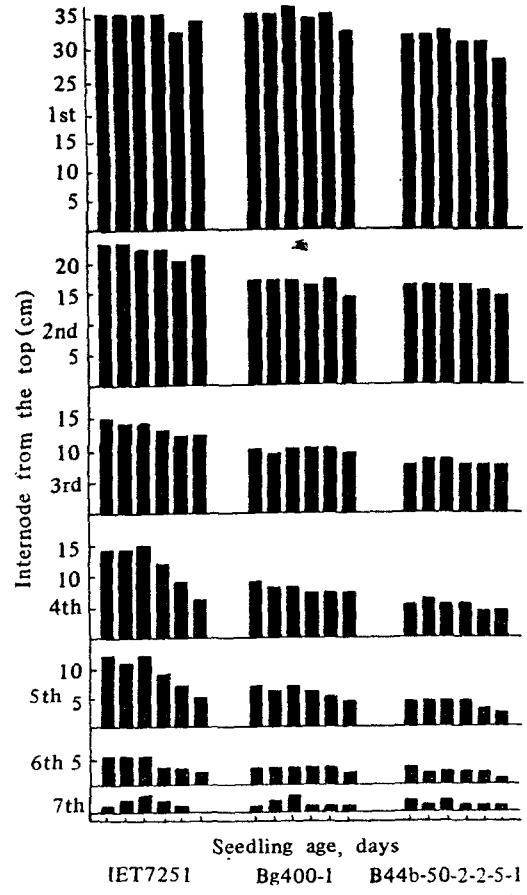

Fig. 2. Aging effects of seedlings on the internode elongation of the rice plant under Parwanipur field condition. 1984.

length in 40 days or older seedlings in all treated rice varieties were mainly due to decrease in length in lower internodes. In all such phenomenon in older rice seedlings might be due to shortage of endogenous plant growth hormones like GA3 while growing for a long time in the seedbed itself because of dense population.

摘　　要

네팔에서 普及段階로 進展된 水稻 3系統 IET 7251, BG 400-1 및 B 44 b-50-2-2-5-1을 6月5日 播種하여 10日, 20日, 30日, 40日, 50日 및 60日 苗를 移秧하고 그들의 出穗日數와 節間伸長을 調査하여 다음과 같은 結果를 얻었다.

1. 稈長은 30日苗 移秧區에서 가장 길었고 그보다 苗垈日數가 길어짐에 따라 현저하게 稈長이 短縮되었다.

2. 肉眼으로 識別이 可能한 節數도 30日苗 移秧區에서 가장 많았는데 40日苗 까지는 큰 差가 없었으나 그보다 苗垈期間이 길어지면 有意하게 節數가 減少되었다.

3. 稈長은 40日苗 移秧區에서 가장 길었다.

4. 出穗 및 成熟까지의 日數는 移秧이 늦어질수록 增加되었다.

LITERATURE CITED

1. Giri, T.P. and K.N. Singh. 1978. Performance of different rice varieties at different age seedlings. Paper presented in the National Summer Crop Workship. Dept. of Agriculture, Harihar Bhawan, Kathmandu, Nepal.
2. Mallick, R.N. and K.N. Singh. 1977. Effect of age of seedling of different varieties at different date of transplanting. Paper presented at Summer Crop Workshop held at Dept. of Agriculture. Harihar Bhawan, Kathmandu, Nepal. March 15 to 18.
3. Mathema, B.B. 1979. Effect of seedling age on performance of some improved rice varieties. Paper presented at 6th Summer Crops Workshop held at Department of Agriculture, Harihar Bhawan, Kathmandu. Nepal. Feb. 26-March 1.
4. Shrestha, G.L. 1980. Effect of gibberellic acid on the internode elongation of rice cultivars. Journal of the Korean Society of Crop Science. 25(1):20-24.
5. Shrestha, G.L., M.H.Heu and S.Z. Park. 1981. Effect of daylength on the panicle enclosing "Gamadi" rice cultivar. Kor. J. Crop Science 26(2):121-124.
6. Shrestha, S.L. 1976. Effect of seedling age, normal transplanting and retransplanting (Kharuhan ro Khaur) on the yield of local variety. Paper presented in Summer Crops Workshop. Harihar Bhawan. Kathmandu, Nepal.