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SHORT COMMUNICATION

DISTRIBUTION OF ^{14}C PHOTOSYNTHATES IN DIFFERENT PLANT PARTS OF SENESCENT AND NONSENESCENT CULTIVARS OF RICE

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A pot culture experiment was conducted to study the solute mobilization pattern in whole plant senescing (Rasi, Jaya and Mahsuri) and whole plant nonsenescing (IR-64, Vijeta and Chaitanya) type rice cultivars. The non-senescent rice cultivar IR-64 (short duration) recorded the highest percentage of ^{14}C photosynthates in all the leaves, sheath and culms. Mahsuri and Chaitanya (long duration) translocated maximum of ^{14}C photosynthates into the panicles by retaining lesser quantities of ^{14}C photosynthates in the leaf sheath+culms.

***Key words*: Nonsenescent, photosynthates, rice, senescent**

Translocation of photosynthates from source to metabolically active sink is a vital phenomenon which influences their development. Murthy and Janardhan (1975) found that the translocation of ^{14}C photosynthates from shoot to panicle was higher in semi tall types than in tall types in rice. Translocation of ^{14}C photosynthates from shoot to panicle was quicker in early types (Jaya and IR-8) than medium and late type rice cultivars (Vijaya and CR-10 cultures) was reported by Murthy et al. (1972). Nayak et al. (1981) reported that the triacontinol was efficient in both by maintaining leaf photosynthetic activity and in translocation of ^{14}C photo synthates to the panicle during ripening stage in rice.

A pot culture experiment was conducted at the Department of Plant Physiology at Agricultural College, Bapatla to study the solute mobilization pattern in six rice cultivars, viz. Rasi, Jaya and Mahsuri (having high senescence score and low regenerative ability), IR-64, Vijeta and Chaitanya (having low senescence score and high regenerative ability) in a factorial randomized block design with four replications. The soil was vertisol. A standard package of practices were adopted to grow the plants in pot culture. The rice plants were fed with radioactive sodium bicarbonate ($NaH^{14}CO_3$) at 10 DAF as per the procedure described by Deka et al. (1997). Beckman LS-6500 liquid scintillation counter was used for counting labelled carbon activity. The radioactivity g^{-1} dry weight was calculated for each plant part separately by using the following formula.

$$\text{Radioactivity in flag leaf (\%)} = \frac{\text{Radioactivity } g^{-1}\text{dry weight of flag leaf}}{\text{Total radioactivity } g^{-1}\text{dry weight of mainshoot}} \times 100$$

The data on percentage of ^{14}C photosynthates distributed into different plant parts of senescent and nonsenescent type rice cultivars are presented in Table-1. Senescent type rice cultivars translocate more (88.2%) percentage of ^{14}C photosynthates into panicles over nonsenescent type rice (80.6%) cultivars, which could be due to rapid translocation of photosynthates and nutrients to the developing sink organs in senescing rice cultivars. Varietal variation in rice panicle photosynthesis was reported earlier by Murthy and Murthy (1981). Nonsenescent type rice cultivars retained about 3.6, 0.07

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Table 1. Percentage distribution of ^{14}C photosynthates in different plant parts of senescent and nonsenescent type rice cultivars.

Cultivars	Plant Parts						
	Panicle	Flag Leaf	Leaf sheath +culm between flag and second leaves	Second Leaf	Leaf sheath +culm between second and third leaves	Third Leaf	Leaf sheath + culm beyond third leaf
Senescent Type							
Rasi	88.1	9.7	1.18	0.03	0.88	0.01	0.08
Jaya	88.2	10.8	0.41	0.05	0.33	0.01	0.17
Mahsuri	88.2	10.1	1.27	0.11	0.18	0.04	0.11
Mean	88.2	10.2	0.95	0.06	0.46	0.02	0.12
Non Senescent Type							
IR-64	75.9	17.3	3.78	0.21	1.91	0.12	0.82
Vijeta	78.7	13.5	4.55	0.13	1.81	0.05	1.28
Chaitanya	87.2	10.6	1.36	0.06	0.58	0.01	0.17
Mean	80.6	13.8	3.23	0.13	1.43	0.06	0.76
SEm ±	1.62	1.39	0.29	0.02	0.23	0.01	0.13
CD (0.05)	4.00	NS	0.87	0.05	0.71	0.02	0.39
CV (%)	5.44	20.70	15.43	22.12	20.76	16.50	21.40

NS: Nonsignificant

and 0.04% more of ^{14}C photosynthates in flag leaves, second and third leaves respectively than in senescent type rice cultivars. The amount of ^{14}C photosynthates present in the second and third leaves was less when compared to the flag leaf because the flag/fed leaf supplies current photosynthates mainly to the panicles at the time of grain filling (Yoshida 1981), lesser quantity of photosynthate was present in the second and third leaves, which might also be due to translocation of photosynthates and nutrients preferentially to the flag leaf. Similar results were reported by Murthy and Murthy (1982) in rice. Thus, the second and third leaves senesced earlier than the flag leaf. The maximum retention of ^{14}C photosynthates in the flag, second and third leaves of nonsenescent rice cultivars could be attributed to the dark green colour of the leaves, higher amounts of nitrate reductase activity (3.70, 1.48 and 0.62 µg g^{-1}fresh weight respectively) and total chlorophyll content (1.82, 1.56 and 1.43 mg g^{-1}fresh weight respectively) in leaves, longer leaf area duration and higher photosynthetic activity of the leaves, when the grain dry weight is still increasing. This indicated the delayed senescing habit of the rice cultivars IR-64 and Vijeta. The amount of ^{14}C photosynthates present in the leaf sheath+culm was more in nonsenescent type rice (1.81%) cultivars when compared to senescent type rice (0.51%) cultivars. The percentage of ^{14}C photosynthates retained in the leaf sheath+culm was decreased gradually from leaf sheath+culm between flag leaf and second leaf to leaf sheath+culm beyond third leaf. This indicates leaves and leaf sheath+culms beyond the flag leaf translocate maximum of photosynthates towards the panicle at the time of grain filling. The nonsenescent type rice cultivars Vijeta and IR-64 retained higher quantities of ^{14}C photosynthates in leaf sheath+culms (2.55% and 2.17% respectively). The photosynthetic capacity was more in nonsenescent sorghum genotypes than in senescent genotypes (Duncan et al. 1981).

From this study, it can be concluded that the nonsenescent type rice cultivars IR-64 (short duration) and Vijeta (medium duration) retained maximum percentage of ^{14}C photosynthates in flag leaf, second and

third leaves and in leaf sheath+culms thus indicated a delayed leaf senescence and retention of dark green colour of the leaves with high total chlorophyll content and more photosynthetic activity.

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