

벼 葉老化가 暗呼吸速度에 미치는 影響

作物試驗場 : 金丁坤, 李文熙

東京大學校 : 秋田重誠

Effect of Leaf Senescence on Dark Respiration Rate during Ripening in Rice (*Oryza sativa* L.)

National Crops Experiment Station : Chung Kon Kim and Moon Hee Lee
Tokyo University : Shigemi AKITA

Objectives :

To investigate whether leaf senescence affect dark respiration rate and its degree, respiration rates of leaf blade from different cultivars and different ripening stages were measured. Leaf color, nitrogen/nonstructural carbohydrate content, and discoloration of leaf segment were also checked. Relationships between respiration rate and those factors are discussed.

Materials and methods :

Three cultivars which have different yield potential and senescence behavior were used.

Two different method of respiration measurement were used. Until heading, whole plant were taken from the field, and three replications were within the same day. At heading and during ripening, main stem and lower strong tiller were selected and leaf blades of same position (Flag, 2nd, ...) were collected. Replications were consisted of 3 continuous days.

Plant materials were taken from the field around 11 a.m. and taken back to the laboratory. Necessary organs were collected and were put in the 6 vinyl chloride chambers with tap water. All chambers were kept in the 25 centidegree dark growth cabinet. CO₂ evolution towards CO₂ free air was measured by infrared gas analyzer. Measurement was initiated around 18 p.m. and finished around 16 p.m. of the next day. Average night time respiration rate (Rs-n) was defined from 19 p.m. to 7 a.m. of the next day.

Nitrogen analysis was according to Kjeldahl-Indophenol method. NSC was Glucoamylase-PAHBAH method.

Results and Discussion

Dark respiration rate of whole plant showed clear decrease as plants grew and peak time within the respiration measurement seemed to be delayed. Average night time respiration rate (Rs-n) also decreased. Varietal difference of Rs-n could only be seen in the early vegetative stage and Teqing showed lowest rate among cultivars tested.

Dark respiration rates of each leaf blade were examined. At the beginning of the measurement, respiration rate was higher in the higher position (Flag, 2nd, 3rd, 4th), but at the peak time, the order was just opposite.

Rs-n of leaf blades were higher at 30DAH than at heading, but at 19 DAH, Takanari and Nipponbare had the lowest rates. To determine the causal factor of this increase of Rs-n in senescent leaves, leaf NSC, N and SPAD value before respiration measurement were tested. Among these factors, NSC had the highest effect against Rs-n.

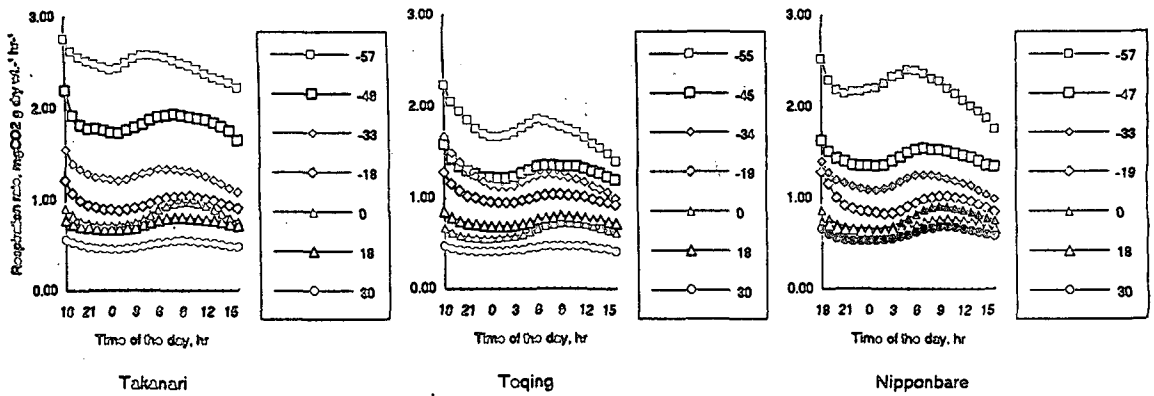


Fig. 1. Variations of whole plant respiration rate measured at different growth stages. Values in legend refer to the date of respiration measurement after heading(DAH).

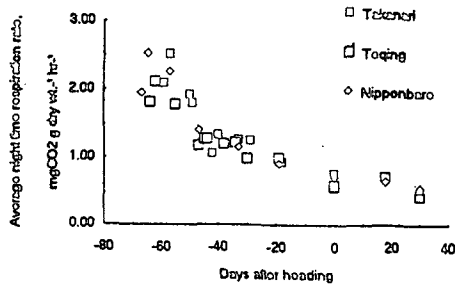


Fig. 2. Variations of whole plant average night time respiration rate measured at different growth stages.

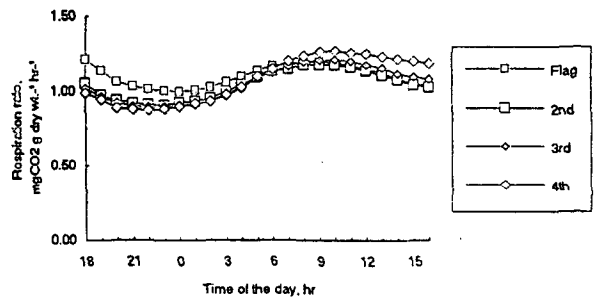


Fig. 3. Variations of leaf blade respiration rate measured at 30DAH. Data in legend refer to the leaf position from top.

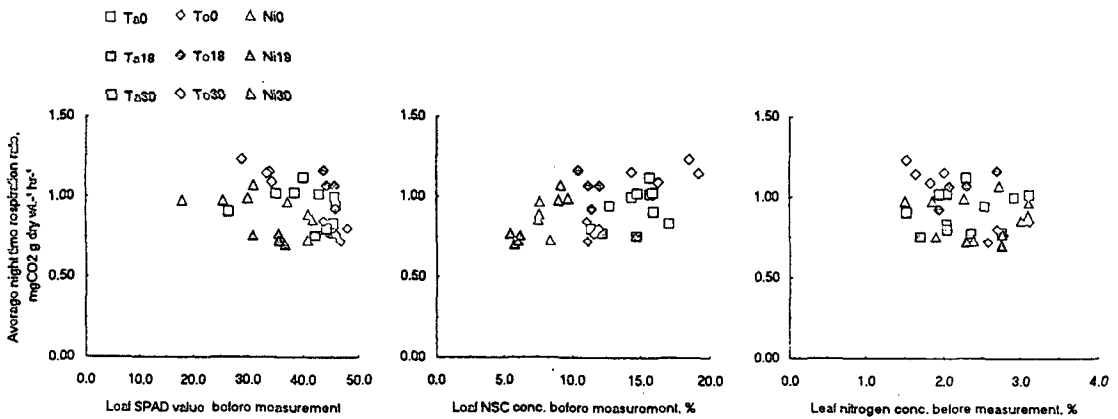


Fig. 4. Relationship between leaf SPAD value(left), NSC concentration(center), nitrogen concentration (right) before measurement and average night time respiration rate.