

水稻雄稔與雄不稔近同源基因系之乾物質生產與分配過程的比較

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中文摘要

在 1987 年第二期作與 1988 年第一期作，以臺農 67 號與高雄 141 號兩稔型品種及臺中私二號與珍汕 97 號兩私型品種，以及彼等之細胞質雄不稔(WA 型)近同源基因系進行試驗。移植後，每隔一週調查株高、分蘗數、葉面積指數以及葉片、莖稈或穗部乾物重。就雄稔與雄不稔近同源基因系在抽穗前之生長發育的一致性進行評估後，得悉兩稔型品種及珍汕 97 號(僅限於第一期作)適於作為探討穀粒充實期間之穗部積儲需求降低對積儲—供源關係影響的材料。自移植至抽穗後第二週，各「適用」品種與其雄不稔近同源基因系在植冠發育與乾物質生產上概無明顯的差異。然則雄不稔系統俟後即產生大量的新生分蘗，而其葉面積指數的降低亦顯著地比雄稔系統慢。唯兩近同源基因系在乾物質生產動態上始終沒有顯著的差異。各「適用」品種與其雄不稔近同源基因系在同化物質之分配型式上呈現極為明顯差異。抽穗後，雄稔植株均以穗部為同化物質的主要積儲；而雄不稔植株則以莖稈及新生分蘗取代為主要積儲。在 1988 年第一期作以臺農 67 號之雄稔植株進行剪穎處理。處理區內之單位葉面積同化速率、作物生產速率以及總乾物質生產量等均顯著低於對照區(雄稔系統)以及雄不稔區；唯其大量新生分蘗的產生與同化物質分配型式的改變則與雄不稔區類似。因此，水稻穗部積儲需求之降低主要在造成同化物質分配型式的改變，而非乾物質生產的回饋抑制；而剪穎之破壞植株完整性，則會對供源—積儲關係造成複雜的干擾。

關鍵字：分配；水稻；生產；同源基因；乾物質；雄不稔；雄稔

Abstract

Two japonica (i.e., TNG67 and KH141) and two indica (i.e., TCS2 and ZS97) rice varieties and their cytoplasmic male sterile (WA type) near-isogenic lines were grown in the second crop season of 1987 and the first crop season of 1988. Traits of plant height, tiller number, leaf area index and dry weights of leaf blade, stem and sheath and/or panicle were recorded weekly throughout the growing season. In respect of the identity in pre-heading growth and development between the CMS and corresponding fertile near-isogenic lines, the two japonica varieties and the variety ZS97 (only in the first crop season) were justified in evaluating the influence of reduction in sink demand of panicle on source-sink relationship during grain-filling period. No significant difference was detected between the justified varieties and their corresponding CMS near-isogenic lines in canopy development and dry matter production till the second week after heading. Nevertheless, significant growth differentials developed in the following weeks in that the CMS plants produced many new tillers. Moreover, a slower rate of LAI decline was observed in the CMS canopy. However, the CMS canopy maintained a dry matter accumulation rate equivalent to its corresponding fertile canopy throughout the plant ontogeny. Significant differences in the assimilate partitioning pattern existed between the justified varieties and their corresponding CMS near-isogenic lines. For the fertile plants, panicle was the major sink for assimilate following panicle growth. However, stem and sheath and new tillers turned out to be the alternative sink in the CMS plants. In the first crop season of 1988, developing spikelets were clipped at anthesis for the fertile plants of variety TNG67. As a result, unit leaf rate, crop-growth rate and total dry matter produced in the de-spikelet canopy were significantly smaller than in the control (fertile) and the CMS canopies. However, the de-spikelet plants tended to produce many new tillers. And their assimilate partitioning pattern were also similar to the CMS plants. It appears that reduction in sink demand of panicle could induce a drastic change in assimilate partitioning pattern rather than an inhibition on dry matter production. And the side effects caused by spikelets clipping might also interfere the source-sink relationship.