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研究论文

种植密度对杂种小麦C6-38/Py85-1旗叶光合特性和产量的调控效应及其生理机制.

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摘要 在低（L，基本苗150株 / m2）、中（M，300株 / m2）和高（H，450株 / m2）3种密度下，供试杂种小麦C6-38/Py85-1及其亲本旗叶生长期间的净光合速率（Pn）、叶绿素含量（Chl）、可溶蛋白含量（Pro）、气孔导度（gs）和叶肉导度（gm）均随旗叶生长进程和密度增加不断降低，杂种各性状对密度变化的反应较其亲本敏感。各性状的离中优势（Hm）均随测定时期的推迟和密度降低不断增大。杂种旗叶生长期间同化的CO2总量（LSC）及其Hm和千粒重及其Hm均随密度增加而降低。杂种LSC在低、中密度下的优势来自净光合速率（平均Pn）、光合面积（LA）和光合功能期（RSP和PAD）较其亲本的提高，高密度下的优势仅来自较亲本LA的增加。杂种在中密度下籽粒产量最高，但与低密度下的产量差异不显著，产量的Hm以在低密度下最大（41.7%），中密度下次之（18.4%），高密度下最低（3.8%）。低密度下的产量优势来自3个产量构成因素的共同提高；中、高密度下主要来自穗粒数的增加。研究表明，生产中可采用发挥杂种小麦个体杂种优势的技术路线，适当降低杂种小麦的种植密度（150～225株 / m2），建立合理的群体结构，充分发挥个体的光合物质生产能力，促进杂种小麦籽粒产量杂种优势的发挥。

关键词 密度 杂种小麦 旗叶 光合特性 产量 生理机制

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Effects and Physiological Mechanism of Planting Densities on Photosynthesis Characteristics of Flag Leaf and Grain Yield in Wheat Hybrid C6-38/Py85-1

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Abstract Using wheat hybrid C6-38/Py85-1 and its parents (female C6-38 and male Py85-1) as materials, the effects and physiological mechanism of different planting densities on photosynthesis of flag leaf and grain yield were analyzed. At different density levels including low (L, 150 plants/m2), middle (M, 300 plants/m2) and high (H, 450 plants/m2) densities, the net photosynthetic rate (Pn), chlorophyll concentration (Chl), soluble protein contents (Pro), stomatal gas conductance (gs) and mesophyll gas conductance (gm) in flag leaves were different and decreased with the leaf growth progress and density increase. Meanwhile, above parameters of flag leaves had much more sensitive response to densities in wheat hybrid than in its parents. The heterosis from mid-parent(Hm) was gradually increased with the leaf growth progress and density decrease. There existed a tightly relationship between the total CO2 assimilation amount during the flag leaf growth period (LSC) and the 1 000-grain weight as well as their Hm, which were decreased with the density increasing. The Hm of LSC in wheat hybrid at low and middle density were caused by the comprehensive improvement in average Pn, LA and photosynthetic active function duration (RSP and PAD), while the Hm at high density came only from the improvement in LA. The grain yield under middle density was the highest, but there was no significant difference between those of middle and low densities. The Hm of grain yield in wheat hybrid was the highest under low density (41.7%), coming from the improvement of all three yield components, then under middle density (18.4%) and the lowest under high density (3.8%), in the case of middle and high densities, the Hm came mainly from the increase of kernel numbers per spike. This study indicated that it is a feasible strategy to develop and promote the heterosis of hybrid on a single plant basis in the production. Suitable decrease of the planting density in hybrid (150—225 plants/m2) will be benefit for the construction of population structure, which has important function to fully increase the photosynthesis and dry matter accumulation in single plant, and finally the Hm of grain yield in wheat hybrid will be enhanced to a much higher level.

Key words Planting density Wheat hybrid Flag leaf Photosynthetic characteristics Grain yield Physiological mechanism

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