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研究论文

成恢448与Basmati 370回交后代的米粒延伸性遗传和相关分析

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摘要 对成恢448(CH448)与Basmati 370的BC_2F_5株系及其与5个不育系配制的杂种F_1，CH448和5个保持系的12个米质性状进行了多元偏相关、通径分析、对应分析和遗传分析。结果表明：（1）CH448和保持系等亲本12个米质性状之间的偏相关性不显著。BC_2F_5株系中，仅饭粒长（CRL）和米粒长（HRL）对米粒延伸性（CRE）有极显著的偏相关，其余9个性状均与CRE没有显著偏相关。F_1中，直链淀粉含量（AC）、碱消值（ASV）对CRE表现为直接偏相关作用，粒型性状谷粒长（GL）、谷粒宽（GW）、长宽比（L/W）与CRE呈间接偏相关作用；垩白率（ChR）通过垩白度（ChS）与CRE产生间接偏相关作用，ChS通过AC对CRE产生影响；理化指标（AC、ASV）对CRE的偏相关影响最大，垩白性状其次，粒型性状更次之。（2）通径分析表明，CRE与11个米质性状间存在极显著的线性关系；CRL和HRL与CRE 的通径系数达到极显著，对CRE有极显著的直接作用和较大的决定程度；ASV与CRE的仅达到显著，对CRE具有显著的直接作用；其他8个性状对CRE的通径系数不显著；除HRL和CRL外的9个性状分别通过这两个性状对CRE产生间接作用。（3）对应分析结果表明，CH448、BC_2F_5株系、杂种F1的CRE、CRL、HRL等性状明显不同于保持系；BC_2F_5株系中的AC、整精米率（HRR）、ChS、ChR产生了较大的性状分离，但绝大多数株系在CRE、CRL、HRL、GW、GL、L/W、ASV、糙米率（BRR）等性状上的差异较小；杂种F1的HRR、ChR存在较大差异，ChS比在BC2F5株系中的差异性更小些，而CRE与其他性状的关系均比较远。（4）CRE、HRL、AC、ChS、GW、L/W等性状的遗传方差以加性效应为主，CRL、ASV、ChR、BRR的遗传方差则以非加性和非显性效应为主。CRE、CRL、HRL等11个性状的广义遗传率在67%～87%之间，CRE、CRL、HRL的狭义遗传率分别为46.9%、64.85%和74.55%。CRL、HRL与CRE之间主要表现为显性遗传相关，HRL、GL与CRE的显性遗传负相关性相近，显性相关系数均大于CRL；AC、ChR与CRE的显性遗传负相关效应依次降低，GW、L/W则更低。改良CRE将对HRL、GL、AC、ChR、GW等性状产生一定的加性和显性遗传效应。

关键词 水稻 米质性状 米粒延伸性 相关性 通径分析 遗传分析

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Genetic and Correlation Analyses of Cooked Rice Elongation(CRE) of the Progenies from Basmati 370 Backcrossed by Chenghui 448

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Abstract The analyses of multivariate partial correlation, path, correspondence and genetic correlation of twelve rice quality indexes were performed using Chenghui 448(CH448), 5 maintainer lines, the progenies from Basmati 370 backcrossed by Chenghui 448(BC2F5) and the hybrids of 5 male sterile lines with the progenies. The results showed that: （1）The partial correlation of 12 rice quality indexes between CH448 and the maintainers was not significant at P<0.05. Among the BC_2F_5 lines, only cooked rice length(CRL) and head rice length(HRL) were significantly partially correlated with CRE at P<0.01, but the other nine indexes were not (Fig.3). In hybrids, the partial correlations of amylose content(AC) and alkali spreading value（ASV） with CRE were direct, whereas those of grain length(GL), grain width(GW) and the ratio between length and width(L/W) with CRE were indirect. Chalky Rice（ChR） interacted with CRE in an indirect way through Chalkiness（ChS）, while ChS though AC. AC and ASV had the most important effects of partial correlation on CRE, chalky traits took the second place, and grain type traits took the last one (Fig.2). （2）The path analysis of F_1 hybrids and BC_2F_5 lines showed that there was highly significant linear relation between CRE and other eleven traits. The path coefficients of CRL and HRL to CRE were up to highly significant level and had highly significant direct effects and larger decision coefficients. The path coefficient of ASV to CRE was significant and had significant direct effect. That of other eight traits was not significant. The path coefficients of nine traits besides HRL and CRL had indirect effects on CRE via HRL and CRL respectively (Ta

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ble 1 and 2). （3）The correspondence analysis showed that CRE, CRL and HRL of CH448, BC_2F_5 lines and the hybrids were distinctively different from those of the maintainers. AC, head rice rate(HRR), ChS and ChR segregated significantly in BC_2F_5 generation, but CRE, CRL, HRL, GW, GL, L/W, ASV and brown rice rate(BRR) had a little difference among most of the lines(Fig.4). Among the hybrids, HRR and ChR had distinct difference, but the difference of ChS was smaller than that in BC_2F_5 generation, while other traits had a little correlation with CRE (Fig.5). （4）The main genetic variances of CRE, HRL, AC, ChS, GW and L/W were additive effects, while those of CRL, ASV, ChR and BRR were non-additive and non-dominant effects. The general heritability in the broad sense for 11 traits including CRE, CRL and HRL were in the range of 67%～87%. The general heritability in the narrow sense for CRE, CRL and HRL were 46.9%, 64.85% and 74.55% respectively (Table 3). Those were dominant genetic correlation between CRE, CRL and HRL and similar negatively dominant genetic correlation between CRE, HRL and GL. In addition, both of their absolute correlation coefficient values were larger than that between CRE and CRL. AC and ChR had degressive negatively dominant genetic correlation effects on CRE, while the effects of GW and L/W on CRE were much low. The improvement of CRE would get additive and dominant genetic effects simultaneously on the traits including HRL, GL, AC, ChR and GW (Table 4).

Key words Oryza sativa Cooking quality Cooked rice elongation (CRE) QTLs Path analysis Genetic analysis

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