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Exploitation of Hybrid Vigour / Heterosis

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Abstract

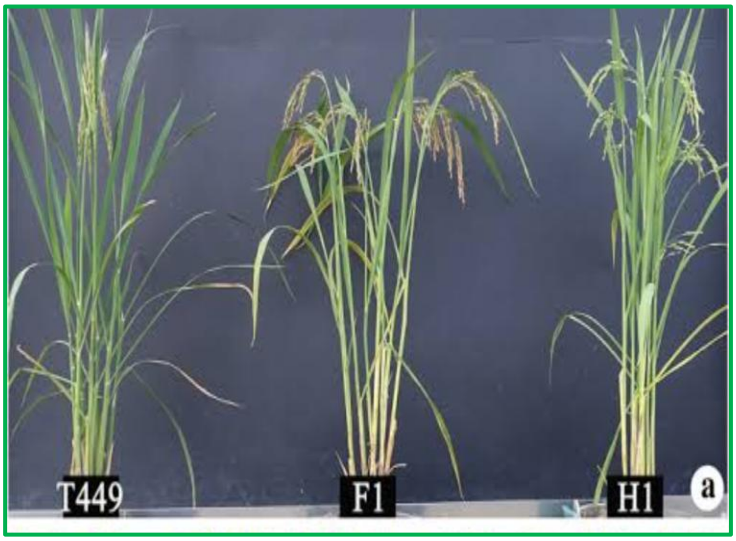
Heterosis is the only way to harness the vitality of crop hybrids. Due to its yield benefits and economic significance, several hybrid rice are sold in more than 40 countries, resulting in the formation of a huge seed industry around the world. Urethane-acrylic hybrid polymer dispersion (HPD) offers excellent cost performance, but usually has a high N-methyl pyrrolidone (NMP) solvent content. New regulations make it desirable to eliminate this substance. However, his high-performance, solvent-free HPD is currently being developed. The new Gemini surfactant significantly reduces MFFT and creates high performance coating formulations with volatile organic compound (VOC) levels below 100 g / l. The vitality of hybrids in cultivated plants was outlined and discussed. It was concluded that hybrid vitality is a quantitative complex syndrome resulting from different genetic actions of multiple gene pairs. It was also concluded that the vitality of the hybrid is rarely due to one example of his genetic action. Therefore, the three cases of genetic action are most likely to interact at the same time. Show the hybrid. The co-epistasis and semi-epistasis effects of several important favourable non-alleles (on the same or different chromosomes) allow the genes to complement each other (gene-gene interactions), demonstrating the power of hybrid traits.

Introduction

Heterosis is the dominance of F1 progeny over either parent, a solitary means of exploiting full hybrid vigour in crops. This phenomenon has aided agriculture and has for centuries attracted geneticists to develop superior strains in many crops. As populations and incomes increase, the world is growing faster than it was in 1995. He needs to produce 60% more rice. This increase in production must be achieved with less land, less labour, less water, and less pesticides, and must be sustainable. Experiences in China, India and Vietnam, indicate that hybrid rice offers an economically viable option for increasing the yield of cultivars above par.

Heterosis in Rice

The use of crossbreeding has been initiated in allogeneic plants such as maize, and inbreeding exhibits inferior phenotypic performance due to inbreeding suppression. Rice is a self-pollinating plant that naturally produces pure lines with high phenotypic performance and little or no suppression of inbreeding. Jones (1926) first reported the existence of hybrid vitality in rice, but advances in hybrid rice development have two main reasons: the superior performance of pure lines and the lack of adequate pollen control mechanisms. It is stagnant at. In India, Ramiah (1935) and Kadam et al. Heterosis has been reported. (1937). Manual emasculation for hybrid development is impractical in rice because it is a self-pollinating plant with many amphoteric flowers per inflorescence. Since it is a self-pollinating plant and farmers have to change seeds every year, commercial-scale hybrid seed production is not possible without a stable male sterility system. Therefore, for commercial use, the parent's One of him must be a female. Therefore, the development of suitable female parents is a major task for the practical application of hybrid rice technology.



Heterosis production by CGMS system

The term cytoplasmic male sterility (CMS) is a generic term for impaired microspore formation that blocks the production of fertile pollen, as opposed to genetic male sterility (GMS). It occurs when mitochondrial genes interact. In most cases, CMS plants impair the late stages of pollen formation. In these cases, CMS is phenotypically represented as changes in tapetal or sporulation (more commonly tapetal) anther tissue, resulting in the formation of sterile pollen or its complete lack. However, some CMS systems also change the morphology of the flowers. Occasionally, homeotic substitutions in the flower part are observed (petaloid or carperoid CMS). CMS forms have been described in over 300 species and interspecific hybrids. The male sterility (ms) phenotype is maternally inherited. Mitochondria in CMS plants always contain a specific type of mt DNA that differs in structure from the normal type of mt DNA. An exception is his CMS type 447 in fava beans, which is associated with the presence of intracytoplasmic self-replicating high-molecular-weight double-stranded RNAs in specific vesicles in the cytoplasm (but not in mitochondria). The core genetic control of CMS is carried out by the Rf gene, which restores fertility in one generation. This regulation is thought to affect other genes as well, and indirect evidence suggests its existence. These hypothetical genes are involved in several mechanisms that restore CMS formation and fertility. It is not excluded that some, if not all, of those activities are not specifically aimed at her CMS control. Several different CMS types have been identified in many species. These types differ in phenotypic expression and/or mode of inheritance. In most cases, each sterile-type CMS form is characterized by a specific type of mt -DNA and a special system of nuclear genetic control.

Conclusion

Since its inception, this technology has had a profound impact on increasing crop productivity and yields and on the livelihoods of farming communities. This chapter outlines the overall state of hybrid technology at Reis, along with a future research and development roadmap to make this effort more practical and sustainable for the benefit of all stakeholders. This chapter identifies the ambiguities that have contributed to the slow adoption of this technology and possible strategies for resolving them. Therefore, this chapter will help researchers and students in planning future hybrid rice breeding strategies.