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REVIEW

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In 1996, a mega project that aimed to develop rice varieties with super-high yield potential (super rice) was launched by

per se is

gram, summarize the advances in agronomic and physiological mechanisms underlying the high yield potential of super

population, dietary shift that has resulted from greater levels

et al

et al

production, the augmentation of crop yields is the most promising approach for maintaining food security with the

et al

et al

half of the global population (Godfray *et al*

et al

it is grown in an environment to which it is adapted in the presence of nutrients and a non-limiting water supply, with the effective control of pests, diseases, weeds, lodging, and

the yield obtained when an adapted cultivar is grown with minimal possible stress, which is achieved with the best

ing resistance, breeding for semidwarf rice varieties was

the utilization of heterosis, which resulted in the hybrid rice

super rice was developed in China through a combination

bined with the application of improved agronomic practices led to the average rice grain yield in China being increased

of these high-yielding rice varieties resulted in the overuse *et al*

) of ca

et al

differences between super rice, ordinary hybrid rice, and

super rice, beginning with the history and success of the

physiological basis for its high yield potential, and examine whether super rice *per se*

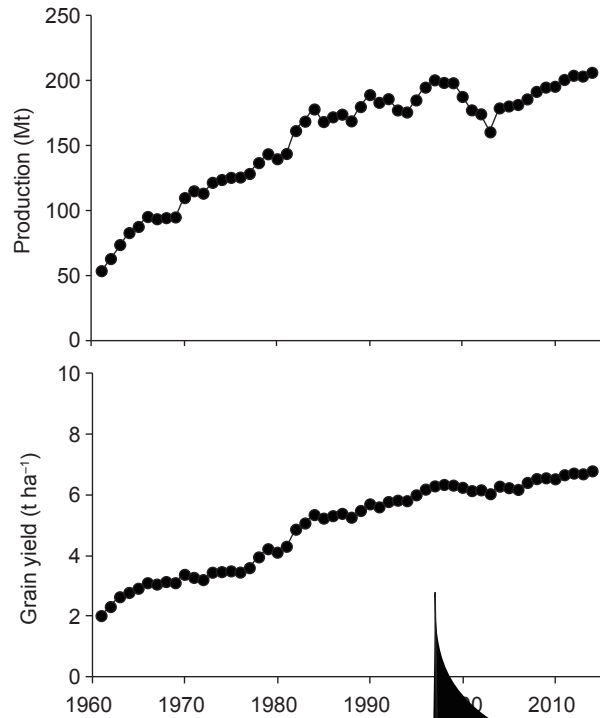


Fig. 1

will help to further progress rice improvement and to identify

indica with *japonica* rice

et al

et al

high-yielding varieties from *indica* × *japonica* hybridizations
et al

attributes (Cheng *et al*

et al *indica* × *japonica*

et al

high-yielding *indica*

et al

-

indica varieties and
japonica varieties, which cover an accumulative planting
-
in 1996

green, thick, and erect leaves, a vigorous root system, a

phases, the representative super rice varieties included

et al

disappointing due to low biomass production and poor grain
et al

for
et al

however, yield potential was still not improved mainly due
et al

et al

by the Ministry of Agriculture (MOA), China, based on a

et al

the following (Cheng *et al*

et al

et al

by

period, slower leaf senescence, higher leaf area density
et al

et al

et al

et al

lated according to the ecological and cropping conditions of
et al

-

sink size that mainly resulted from the larger panicle size
rather than panicle number, which in turn was partly due
to the larger number of primary and secondary branches
et al

panicle type for Southwest China (Zhou *et al*

increased differentiation and survival of spikelets in super
rice resulted from its higher photosynthetic capacity and
et al

et al

et al

following features contributed to the high yield potential of

et al

parameters, which facilitate the increased canopy photosynthetic rate

et al

that a high leaf photosynthetic rate and root activity during

duction after heading

transport after heading, longer, thicker, and more erect upper three leaves were important morphological and physiological

et al

sheath, leaf and stem, which helps to maintain the activity of the spikelets for longer

with the growth and development of above-ground part of plant, however, there have been relatively less study

et al

However, the high yield potential of super rice varieties

plant height, panicle length, grain yield per plant, number of spikelets per panicle, and grain setting density showed a

et al
enzymes in carbon assimilation, rather than assimilate sup-

root length, total root length, dry root weight, root surface

et al

et al

further demonstrated that higher root oxidation activity per plant at early and mid-growth stages resulted in the

Compared with the inbred high-yielding varieties, super rice

et al

have revealed new mechanisms underlying the poor grain

et al

et al

et al

adenosine iphosphate-glucose pyrophosphorylase (AG-

(Zhang H *et al* *et al*

of root tip cells plays an important role in yield formation in rice, and it was observed that at the panicle initiation, a super

key role in the metabolism of carbohydrates in developing

per panicle had more amyloplasts and mitochondria in root

et al

focus on the causes for faster root senescence of super rice

for the superior and inferior spikelets, and concluded that the relatively high concentrations of ethylene and abscisic

of starch synthesis genes and their enzyme activities and

et al

(Sun *et al*

et al

et al

et al

cell cycle progression and cell division, were downregulated

), representing only a

-

green traits were collected, and their growth, nutrient uptake and utilization, and yield production under different water,

-

pheromones and host plant volatiles affecting the behavior

found that *Xanthomonas oryzae* *oryzae* -

predator (Sun *et al*

optimized crop management practices have been developed

is found that reduction in the application of chemical fertilizers and pesticides and water-saving technology is pressing

mechanized crop management practices should be one -

management practices have been widely used by farmers, such as the completely mechanized ratoon rice production

patterns of rice pests, and to develop integrated pest man-

of these varieties have contributed to their increased yield potential, together with changes in other agronomic and physiological traits such as canopy architecture, leaf photosynthetic physiology, and translocation of pre-anthesis

to examine trends in the development of rice breeding and

-

these yield improvements, rice cropping is facing a series of challenges, such as resource exhaustion, climate change,

stresses, and so it is necessary to diversify the breeding

et al

-

) showed that deeper roots, greater root

et al

produce a high grain yield while reducing the resource inputs and environmental costs in a world with a changeable

varieties was developed in different provinces aiming to in-

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- Crop Science*, **39**,
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- japonica-indica* hybridisation
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- Science*, **327**
- several physiological characteristics between *indica* and
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- Planta*, **241**
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- Field Crops Research*, **198**
- grain yield components from high yield to super high yield and the characters of super-high yielding *japonica* super
- Acta Agronomica Sinica*, **43**

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