



# **DEVELOPMENT AND MAINTENANCE OF A,B,R LINES**



## Hybrid Seed Production

Prof. Yuan Long Ping is the father of hybrid rice in China. The successful development and use of hybrid rice technology in China during 1970's led the way for development and release of rice hybrids in India. Hybrid can be produced by three different methods

1. **Three line system:** In this method hybrid rice is produced by utilizing cytoplasmic genetic male sterile system. The source of male sterile cytoplasm used is wild abortive. In this method there are three different lines i.e. A-line or male sterile line, B-line or maintainer line and restorer line or R-line. For maintaining A-line it has to be crossed with B-line and for producing hybrid seed A-line has to be crossed with R-line.
1. **Two line system:** This method of hybrid rice seed production involves the use of photoperiod sensitive genetic male sterile system or temperature sensitive genetic male sterile system. In this method any normal line can be used as restorer line.
1. **By Using chemical emasculates :** The chemicals which kills or sterilise the male gamete with little no effect on the normal functioning of the female gamete can be used to emasculate female parental line in hybrid seed production. In China chemical emasculants are commonly used in hybrid seed of rice. In India they are not used commercially for hybrid seed production, but they are used in academic studies. The chemical which can be used as potent gametocides are ethereal, maleic hydrazide, etc.

## Hybrid seed production (using three line system)

The hybrid seed is produced by utilizing cytoplasmic genetic male sterile system.

The source of cytoplasm used is wild abortive.

One of the drawbacks of wild abortive cytoplasm is incomplete panicle exertion from the flag leaves.

Hybrid seed production involves two steps;

1. Maintenance of parental lines (A-line, B-line and R-line)

2. Commercial hybrid seed production (A $\times$ R).

- Maintenance of parental lines is generally referred as foundation seed production and hybrid seed production as certified seed class.
- The A-line can be maintained by crossing with B-line in an isolated plot, while in hybrid seed production A-line is crossed with R-line or fertility restorer line.
- The B-line and the R-line can be maintained just like normal varieties by following the required isolation and field standards. As the maintenance of B-line and R-line is just like normal varieties it is not discussed in detail.

## Maintenance of A-line or Hybrid seed Production:

**Land requirement:** The same crop should not be grown in the same piece of land in the previous one season. The land requirement should be followed for nursery as well for the main field.

**Isolation requirement:** atleast 200 meters for seed classes A, B & R-line production and by 100 meters for hybrid seed production (A x R).

For hybrid seed production (A x R), if space isolation is a problem we can go for time isolation or barrier isolation.

-Time isolation the difference between the flowering of seed plot and the contaminating plot should be atleast 4 weeks.

-In barrier isolation a barrier crop which is of 6-8 feet height should be grown around the seed plot for 10 to 10 meters. The commonly used barrier crops are daincha, sugarcane, sorghum etc.

**Brief cultural practices:** The success in hybrid seed production depends on **synchronization of flowering** between male and female parent.

- For maintenance of A-line synchronization of flowering will not be a problem as both A and B-lines iso-genic
- In hybrid seed production synchronization will be a problem as A-line and Rline have different genetic constitution.

**TO OVERCOME THIS** - Generally the A-line is sown once while the B-line or Rline is sown three times at an interval of five days. When both A and R-line are of same duration sowing of A-line should be adjusted with second sowing of R-line. If A and R lines are of different growth duration, the difference in duration should be adjusted with second sowing of Rline.


**Planting ratio** : The row ratio of female and male parental varies from region to region depending on weather conditions and potentiality of parental lines. The commonly adopted planting ratios of male and female are 2:8, 2:6 or 3: 8.

- Factors influencing the row ratio are; There can be more than 8 A lines in relation to 2 R -lines,
  1. If R-lines are taller than seed parent
  2. 2. Have good growth and vigour
  3. 3. Have large panicles and
  4. 4. Shed a large amount of residual pollen.

The Character of A-line should be

1. It should be shorter than pollen parent
2. Has long duration of floret opening and stigma receptivity
3. Should have wide angle of floret opening
4. Should have a higher percentage of stigma exertion

Transplanting should be done when the seedlings are 25-28 days old. Before transplanting mix all the B or R-lines sown on three different dates. All the missing hills should be replaced within seven days. The spacing adopted for A-line is 15x15 cm and for B or R-line is 20x15 or 30x15 cm. All the recommended package of practices should be followed to raise a good crop.



**Number of Field Inspections** : A minimum of four field inspections should be conducted.

- First conducted before flowering stage
- second and third during flowering stag
- fourth before harvesting.

**Rouging:** Rouging should be done in both male and female parental lines.

- Remove all the offtype and volunteer plants from both male and female parental line.
- During flowering period rouging should be done daily to remove the pollen shedders from female parental line.

**Harvesting and threshing** : Harvest the male row first and remove them from the field so a to avoid mechanical mixtures. Then harvest the female rows.

**Precautions should be taken while harvesting not mix male and female plants.**

**Threshing should be done on a clean threshing floor and the seed should be winnowed and dried to safe moisture limits before storage.**

Presently three line method using CMS in the system 3 lines, parents are involved in hybrid seed production the parents are A line B line and R line

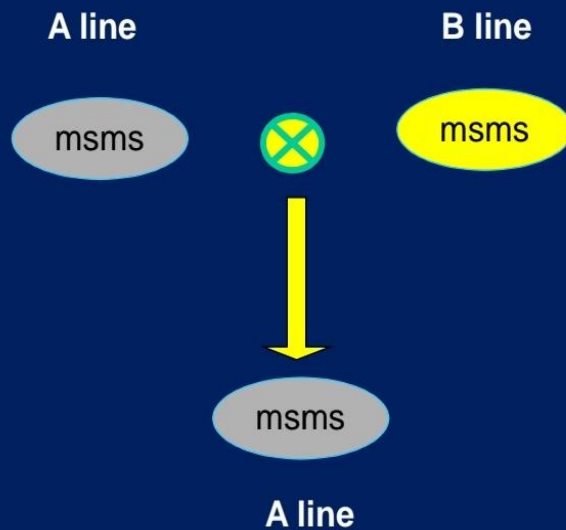
**A line** it is a cytoplasmic male sterility in which is used as female parent in hybrid seed production.

**B line** it is isogenic to A line and it is used as pollen parent to maintain male sterility in A line

**R line** this is also called as fertility restorer or pollinator line

## Development of A-line

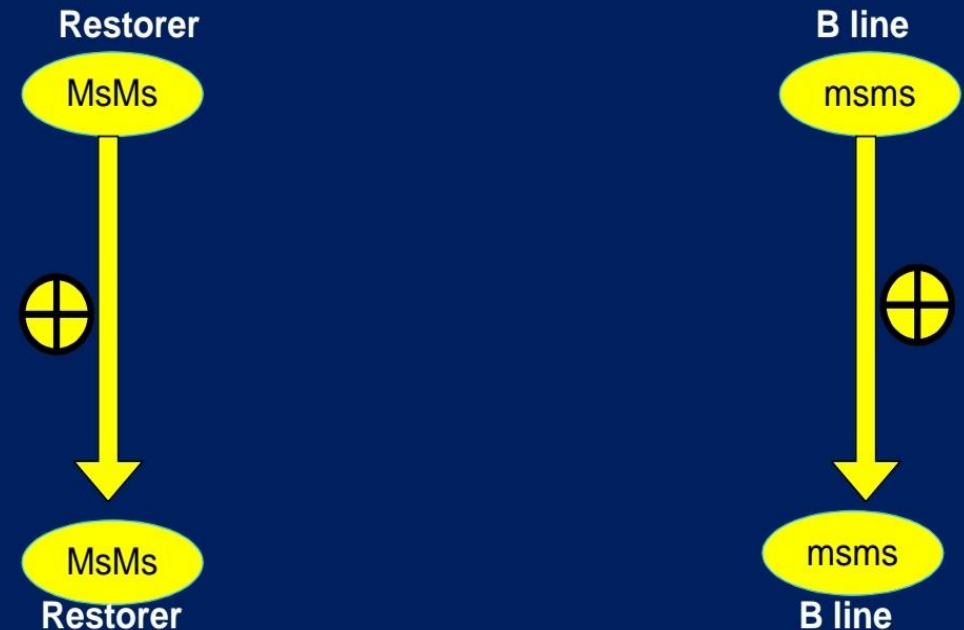
Seed of A line is produced by making cross between A X B



## Development of R-line and B-line

Seed of R line is produced by selfing (male fertile)

Seed of B line is produced by selfing (male fertile)



## Hybrid seed production using A and R Line

Hybrid seed is produced by making cross between A X R

A line

msms

Restorer

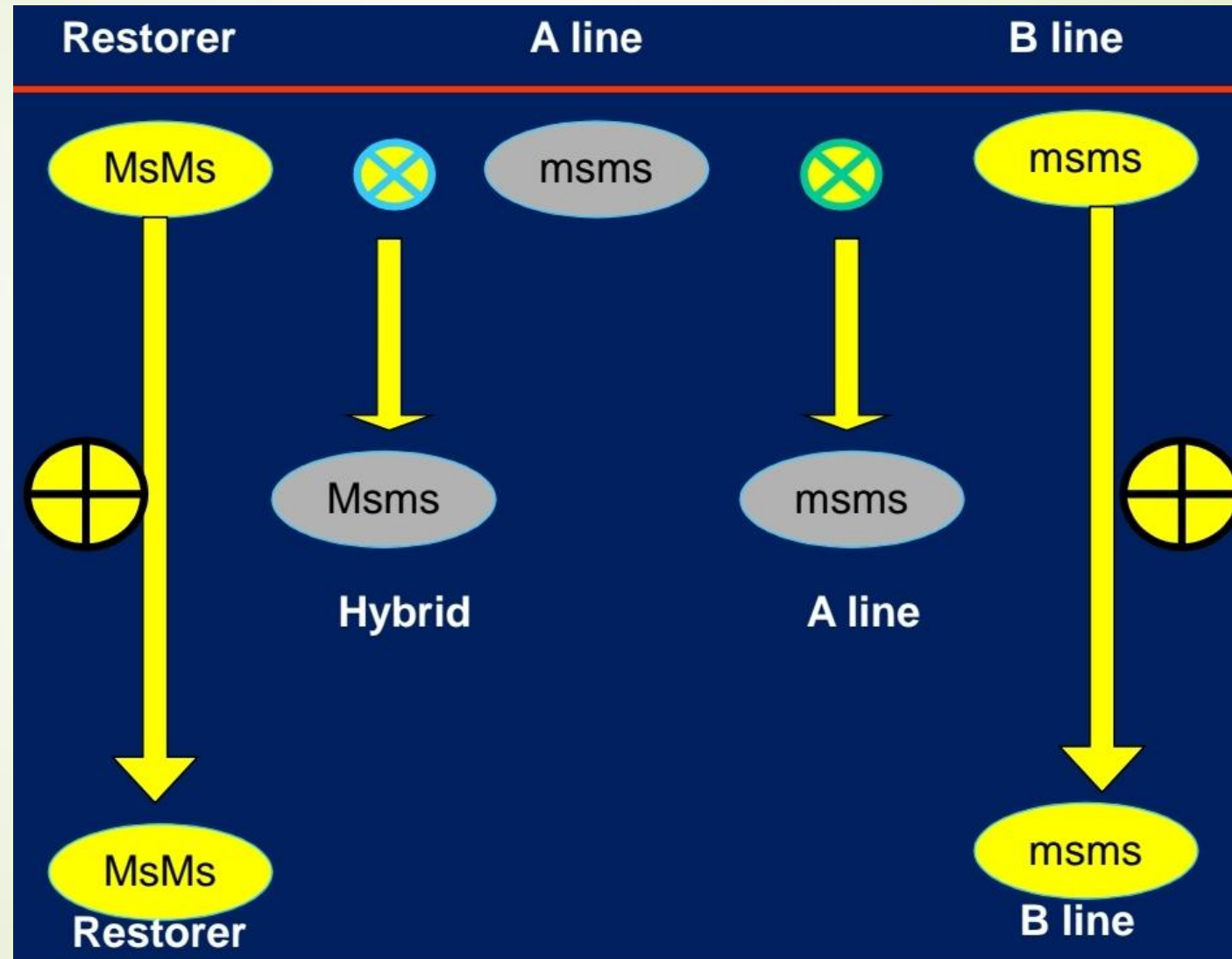
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Hybrid







**THANK YOU**