



Green Food Research Institute of Anhui Academy of Agricultural Sciences (AAAS-GFRI)

## Application of Herbicide Lethality in Hybrid Rice

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## Conventional hybrid rice seed production

Conventional method



Disadvantages

- Row planting, hard to mechanical operation
- Low yield
- Labor-intensive
- High production cost

*A new technology is needed to solve these problems*

## A new technology for hybrid seed production

- mixed planting of male and female
- easy to mechanical operation
- high yield
- less labor-intensive
- low production cost

*How to achieve it?*

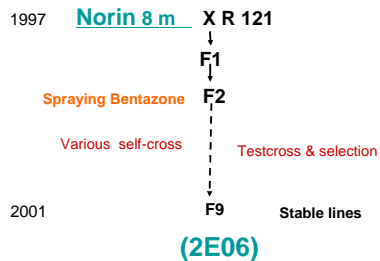
## The key of the technology

- How to eliminate male parent plants?
  - ✓ Integrate the sensitivity to **Bentazone** trait into restore lines (R-lines).



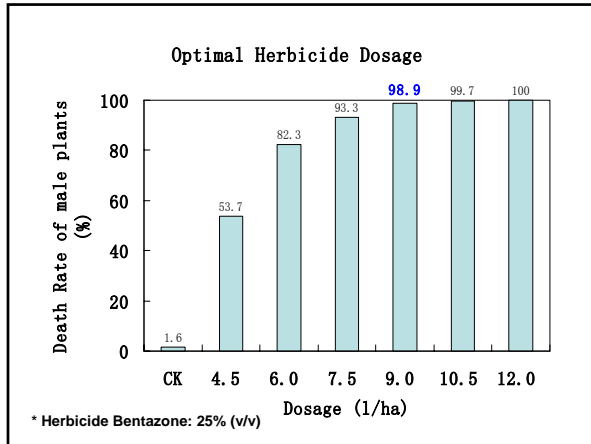
- Select R-lines with
  - ✓ Bentazone-sensitivity
  - ✓ Same or similar days to flowering with CMS lines

## Transfer Bentazone-sensitive trait from Norin 8 m to restore line 121



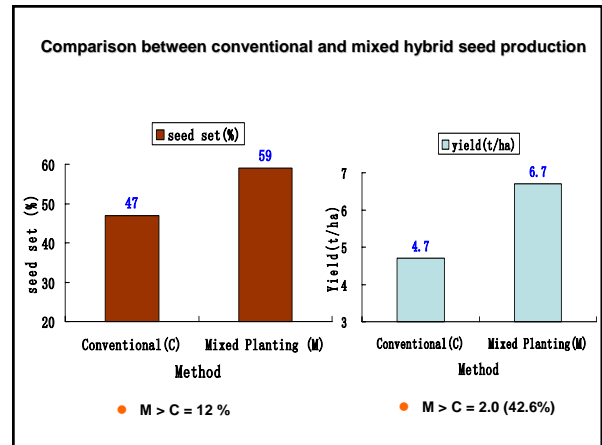
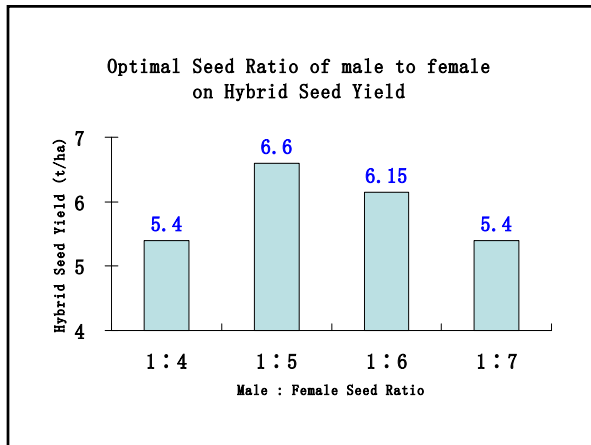
## Key techniques

- Optimal herbicide dosage
- Optimal stage to spraying Bentazone
- Optimal male to female seed ratio



### Optimal stage to spray Bentazone

Spraying stage	Seed Set (%)	Seed set of male parent (%)	F1 seed yield (kg/ha)	Seed purity (%)
5% heading	62.8	0.6	5408	98.4
10% heading	68.7	1.1	5450	97.5
50% heading	63.6	4.0	5073	96.8
80% heading	60.7	14.7	4794	95.1



### Production cost comparison

Treatment	Plow land	Seedling	Labor		GA3	Fertilizer and pesticide	Harvest	Water	Total
			Transplant	Field Management					
Manual mixed planting	219	178	231	462	69	605	115	231	2109
Mechanical mixed planting	219	201	115	462	69	605	115	231	2017
Mechanical direct sowing in dry field	254	85	0	462	69	628	115	69	1682
Direct sowing in paddy field	219	85	58	462	69	605	115	115	1728
Conventional	219	143	346	1154	185	702	185	231	3164

Note: unit: \$/ha ; 1\$=6.5 RMB

### Hunzhi 1

Yield trial

## Mechanized hybrid seed production



Plowing land



Mixed planting



Directly sowing mixed seeds in dry field

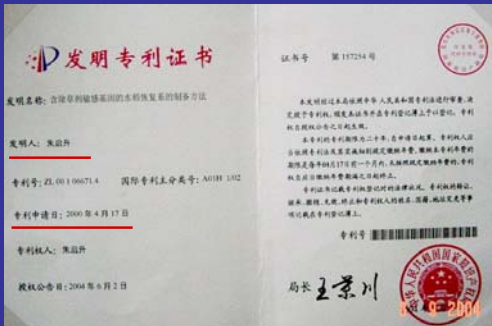


Bulk harvesting

## Conclusion

- Successfully applied Bentazone sensitivity and developed a new technology for hybrid rice seed production
  - ✓ Increased seed yield
  - ✓ Reduced labor and production cost
  - ✓ Simplified the operation
  - ✓ Easy to mechanize
- This technology has been used for commercial hybrid seed production

This technology has been patented in China



# Thank you!

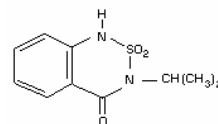


## Norin 8 m

- A mutant derived from the japonica Norin 8
- Introduced from Japan in 1995
- Sensitive to herbicide **Bentazone**
- Controlled by recessive locus

## Bentazone

- The active ingredient of herbicides such as "Basagran"
- Widely used in rice field for weeds control
- Chemical structure: 3-isopropyl-1H-benzo-2,1,3-thiadiazine-4(3H)-ketone-2,2-dioxide



## Lusan A

- A cytoplasmic male sterile (CMS) line
- Released in 2004
- Days to flowering: 77 days



Flower

Seed production

