CYTOPLASMIC GENETIC MALE STERILITY IN EGGPLANT

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Introduction

- Cytoplasmic Genetic Male sterility (CGMS), a technology being successfully utilized for simplified seed production, 100% genetic uniformity, and cost effective seed production.
- CGMS provides parental security.
- It is available in most field crops and in some vegetable crops.
Introduction

- Ankur Seeds introduced CGMS technology in brinjal
- Ankur Seeds is ready to license the technology to fellow Seedsmen around the globe.
Eggplant Cultivation in Asia Pacific Regions

India

Sri Lanka
Eggplant Scenario

- Eggplant is a vegetable crop of Solanaceae family
- A must vegetable required for cultivators and consumers
- Wide variability in crop has made it popular for its distinct appeal in form of either variety or hybrids.
Eggplant Scenario of Leading 11 countries

**Area Harvested (000'HA)**
- China
- India
- Iran (Islamic Republic)
- Egypt
- Europe
- Turkey
- Indonesia
- Iraq
- Japan

**Production (000'MT)**
- China
- India
- Iran (Islamic Republic)
- Egypt
- Europe
- Turkey
- Indonesia
- Iraq
- Japan

**Yield (000'MT)**
- China
- India
- Iran (Islamic Republic)
- Egypt
- Europe
- Turkey
- Indonesia
- Iraq
- Japan

Source FAO 2011
Hybrids cultivated all over the world 8 - 45%

- Hybrids being preferred for the % heterosis achieved for yield and quality.
Hybrid Production Requirement

- Easy and simplified seed production for hybrid vegetables is the prior requirement of Breeders.
- Heterosis and uniformity with 100% genetic purity in product is the basic requirement of the market.
Hybridization in Eggplants

- Hybridization in Brinjals is done after emasculation which involves labour and labour skill.
- Genetic purity requirement is 98-99 % in market
- Increase in % of female parent leads to failure in seed lot.
Hybridization in Eggplants

- Non uniformity in F-1 also leads to failure in seed lot.

- Hence Cytoplasmic Genetic Male sterility is being introduced in Eggplant.
CMS development

- Interspecific crosses were attempted.
- F1 from wild and cultivated was obtained.
- F1 generation – male sterile.
- Normal Backcross technique was followed for inheritance of the trait.

Wild species  X  Cultivated (S. melongena)

F₁ male sterile
Sterile and fertile flowers

Male sterile flower

Male fertile flower
Fertility restoration

- Restorer Line Identified and confirmed
- 100% fruit setting in A line
Restorer development

Identified restorer

Developed restorers
Evaluation of restoration ability

Ank-1A × Ank-1R → F₁

Fruit

Seed

Observations

- Anthers of male sterile plants were shriveled and less developed.
- Microscopically, pollens of male sterile plants were deformed, amorphous and unstained.
- All the F1 hybrids were fertile with normal seed set.
- Restoration in A line confirmed
Genetics

- It's a perfect Cytoplasmic Genetic Male sterility
- Two gene governed trait, segregates in Mendelian Ratio 9 : 7
- Expression and stability of male sterility and restoration was absolute over environments.
Stable CMS (A x B) maintenance lines

- Green Long
- Round shape, Green with White stripes
- Round shape, Purple colour
- Oval shape, Purple colour
Advantages of CGMS technology

- **Parental line security**
- **100% genetic purity**
- **Uniform and stable hybrids**
- **Easy and cost effective hybrid seed production**
Cost Effective Seed Production

- This depends on the cost of seed production of hybrid eggplant as per geographical regions.
- 100 % emasculation cost saved
- No female selfed fruit
- Caution: Male plant to be uprooted timely, before F-1 seed collection, as a rule.
Need of the hour

“Adopt CGMS technology in eggplants for parent line protection & simplified seed production”
Technology Ready to be licensed to fellow Seedsmen

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Important Areas for Breeding and Collaboration

Resistance for Phomopsis Blight and TOSPO is the Need of the Hour for Eggplant Growers Equivalently to the insect/pest resistance.
Percent Damage due to phomopsis is 35 to 40 %
Infection on stem

Infection on Fruit
Countries associated with Tospo virus disease occurrence in Brinjal

<table>
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<tr>
<th>Countries</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Spain</td>
<td>Breeding programme for resistance to TSWV in eggplant</td>
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<tr>
<td>Malaysia</td>
<td>Virus diseases occurring on some vegetable crops in West Malaysia.</td>
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<td>Italy</td>
<td>Tomato spotted wilt virus on eggplant in Sicily (Italy).</td>
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<tr>
<td>Beijing</td>
<td>Tomato spotted wilt virus was identified in Beijing</td>
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<td>India</td>
<td>Observed in South India</td>
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**Symptoms**

- Foliar symptoms include yellow or necrotic concentric ring patterns, and mosaic with chlorotic and necrotic spots.
- Necrotic streaks can develop on stems and extend to the top of the plant. In some cultivars, the apical shoot dies and leaves drop.
- In pepper, reduced laminar growth can cause a shoestring appearance to leaves.
- Pepper and **eggplant** fruit are deformed and often drop. Usually small chlorotic or discolored spots develop that later turn necrotic. Fruit scarring and distinct concentric rings can also develop. In pepper fruit, red, green and yellow discoloration is often present. Seeds inside affected fruit may turn black.
Thank you