UPOV
International Union for the Protection of New Varieties of Plants

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Technical Working Party for Agricultural Crops

TWA/51/10

Fifty-First Session
Cambridge, United Kingdom, May 23 to 27, 2022

Original: English
Date: June 2, 2022

EXAMINING HYBRID VARIETIES

Document prepared by an expert from the United Kingdom

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The annex to this document contains a copy of a presentation “Examining Wheat Hybrids”, made by an expert from the United Kingdom, at the fifty-first session of the TWA.

[Annex follows]

Examining Wheat Hybrids

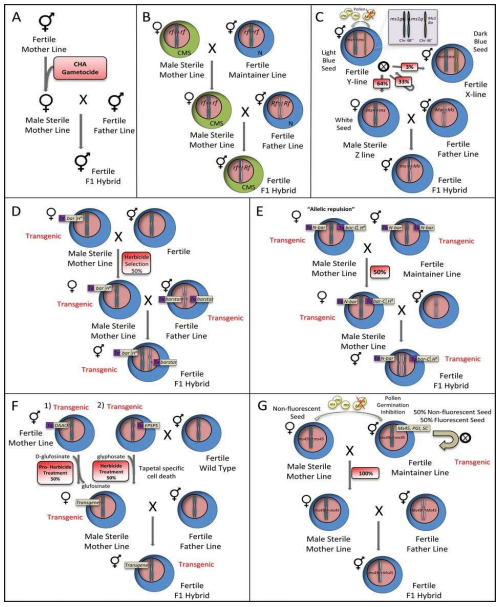
Margaret Wallace, United Kingdom, UPOV TWA 51

Aim:

To encourage the group to consider if the standards included in the current wheat test guideline are appropriate for all types of hybrid production.

TG/3/12

- 4.2.3 The assessment of uniformity for hybrid varieties depends on the type of hybrid and should be according to the recommendations for hybrid varieties in the General Introduction.
- 4.2.4 Where the assessment of a hybrid variety involves the parent lines, the uniformity of the hybrid variety should, in addition to an examination of the hybrid variety itself, also be assessed by examination of the uniformity of its parent lines.
- 4.2.9 For the assessment of uniformity of hybrid varieties, a population standard of 10% and an acceptance probability of at least 95% should be applied. In case of characteristics indicated by B, the sample size for the assessment of uniformity may be reduced to 200 plants. In case of a sample size of 200 plants, 27 off-types are allowed. In case of a sample size of 100 ear-rows, plants or parts of plants, 15 off-types are allowed.



Hybrid breeding in wheat: technologies to improve hybrid wheat seed production

Ryan Whitford, Delphine Fleury, Jochen C. Reif, Melissa Garcia, Takashi Okada, Viktor Korzun, Peter Langridge

Journal of Experimental Botany, Volume 64, Issue 18, December 2013, Pages 5411–5428, https://doi.org/10.1093/jxb/ert333

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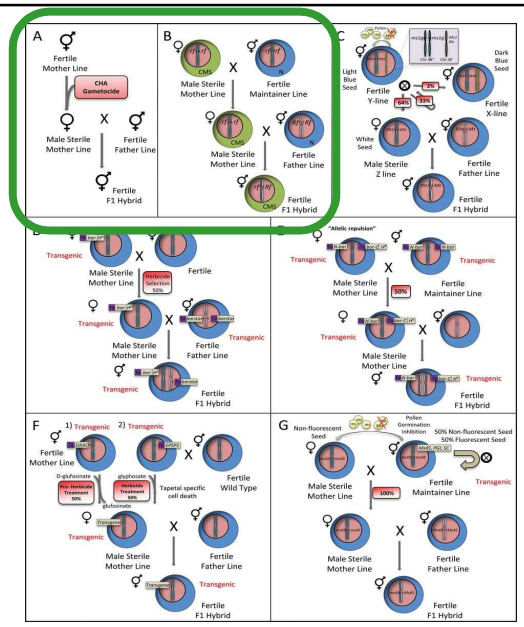

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Fig. 4. Hybrid breeding systems that utilize pollination control.
(A) Chemical hybridizing agents (CHAs).
(B) CMS-based hybrid breeding system. Individuals independently inherit cytoplasmic male sterility (CMS) or native (N) cytoplasm as well as nuclear-encoded restorer loci (Rf, rf)

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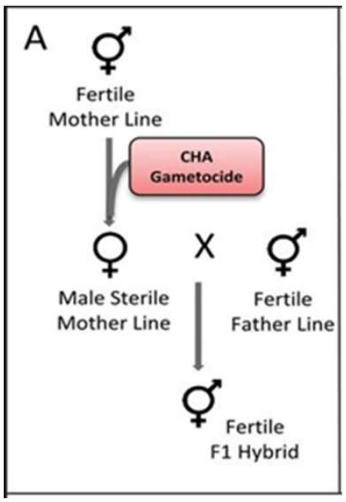
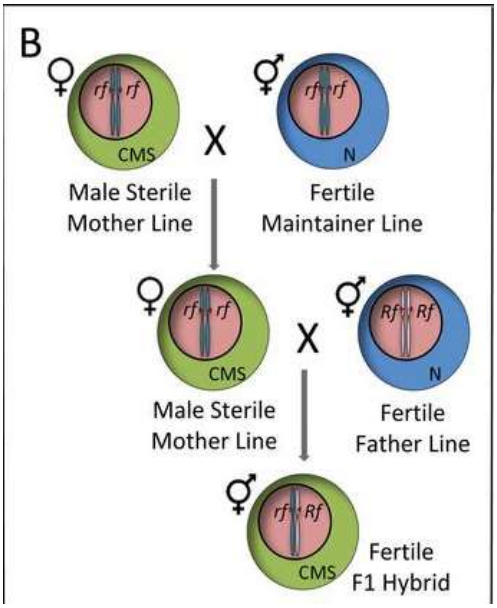
Chemical hybridisation

- Chemical Hybridisation Agents (CHA) are chemicals used to cause male sterility in seed production systems.
- Male sterility can be induced in a female inbred parent by spraying a chemical.
- Allows the production of a high number of parental combinations for estimating germplasm combining ability.
- A number of factors can affect success including
  - Agent used (some can induce female sterility or affect the F1 seed)
  - Environment (rain and heat can reduce efficacy)
- Limited uptake in commercial systems in the UK.



Cytoplasmic Male Sterility (CMS)



- CMS in plants is based on rearrangements of mitochondrial DNA, which lead to chimaeric genes and can result in the inability to produce fertile pollen.
- CMS lines can be created by initially crossing common wheat as the pollen donor to wild wheat or related species and then backcrossing to common wheat.
- The effect of male sterility-inducing cytoplasm in wheat can be counteracted by nuclear-encoded fertility-restorer (Rf) genes.

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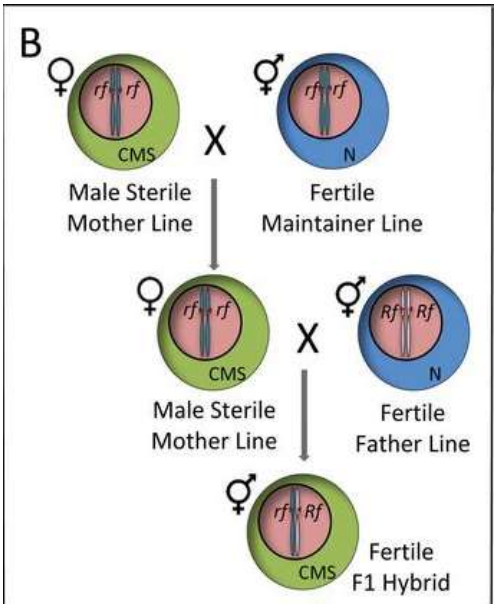
Cytoplasmic Male Sterility (CMS)



- Maintainer line has identical nuclear genotype but a fertile cytoplasm.
  - is used to maintain the male sterile line,
  - The maintainer line carries recessive restorer allele (rf);
  - when this male-fertile line is crossed to a sterile CMS plant, it creates sterile progeny.
- The male-sterile line must be crossed to a line carrying dominant restorer alleles (with excellent pollinator qualities) to produce fertile F1 seed.

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Questions to consider:

- Is it appropriate to have the same uniformity standards for the different methods of propagation?

Maybe not

- Do we have enough information now to make that decision?

Probably not

- Should we compare experiences?

Yes please

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[End of Annex and of document]