AgriCos e-Newsletter
ISSN: 2582-7049
Volume : 01 Issue : 06 October 2020 Article No: 18

# Humidity - Sensitive Genetic Male Sterility: A New Tool in Rice Breeding

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**SUMMARY**

Male sterility conditioned by the humidity may become a desirable trait for breeding several crops like rice, wheat, and maize. In Humidity – sensitive Genetic Male Sterility (HGMS), the mutant plants are male sterile at low relative humidity (RH< 60%), but fully male fertile at high relative humidity (RH >80%). Pollination and fertilization in flowering plants involves a series of pollen – stigma interactions viz, pollen adhesion,hydration, germination of tube. These steps are very crucial for compatible matting between pollen and stigma but underlying mechanism are however poorly understood. The process is complex as pollen should have to overcome the surface barriers at stigma and successful pollen adhesion, germination and subsequently tube invasion.

## INTRODUCTION

This progression is selective to type of stigmatic surface (dry or wet), waxy cuticle and stigma secretions. Pollen adhesion is prerequisite for pollen hydration because compatibility is established as soon when compatible pollen grains adhere to the papillae and access stigmatic water which allow subsequent pollen germination and tube invasion, several pollen -coat derived factors have been implicate in pollen adhesion and hydration. The pollen coat (also called pollenkitt or tryphine) is a pollen extracellular matrix, the outermost layer of the pollen grain which protects the released pollen grain from desiccation, damage and pathogen attack, enabling the completion of pollination. Studies have revealed the presence of lipids,proteins carotenoids ,flavonoids , fatty acids, isoprenoids , glycoconjugates in pollen coat.

It has been reported that rice and other grass species have thinner pollen coatsmaterials than Brassicaceae species which are abundant in pollen coat materials. Pollen coat secretions were involved in pollen adhesion and mutant that deficient in pollen coat formation may have conditional male sterility phenotypes. This male sterility is however found to be conditioned with humidity where mutant plants are male sterility at low relative humidity (RH <60%) but fully male fertile at high relative humidity (.805) as reported in rice .there are several molecular factors to understand with this humidity-sensitive genetic male sterility(HGMS0 which have been reported in rice.

## Molecular Mechanism Involved in HGMS:

### 1. Rice member of the glossy family (OsGL1-4):

OsGL1-4 is a member of glossy family in rice which is preferentially expressed in pollen and tapetal cell, and is required for the synthesis of very long chain alkanes Mutation in OsGL1-4 resulted in defective fertility and OsGL1-4 mutant generated apparently normal pollen , but displayed excessively fast dehydration at anthesis and defective adhesion and hydration under normal condition , but the defective adhesion and hydration were rescued by high humidity . OsGL1-4 mutant were almost completely sterile under normal RH, but had more than 80% seed setting rate under high RH.

### 2. Oxidosqualene cyclases(OSCs):

The pollen coat constituent includes isoprenoids, A branch point enzyme viz, Oxidosqualene cyclases (OSCs) in isoprenoids biosynthesis is involved in converting a basic terpenoid precursor, 2,3- Oxidosqualene, to diverse set of functional steroids and triterpenoids, which are often involved in plant defence. OsOSC12is a grass species -specific triterpene synthase that is expressed in the anther and OsOSC12defective mutants have less pollen coat material than wild type and display a humiditysensitive genetic male sterility (HGMS) phenotype. These OsOSC12 defective mutants shows male sterility at 30-60% (low RH) and male fertility at high (80-90%)

## CONCLUSION

Currently rice breeding strategies make heavy use of hybrid varieties. Conditional male sterility has been dependent on two -line Genetic male Sterility system involving use of PGMS /TGMS (Photoperiod sensitive GMS/ Temperature sensitive GMS). TGMS is Very sensitive to temperature so that the fluctuation outside the desired temperature range (22-24℃) for the male sterile may result in fertility, PGMS is also influenced by the day length requirement above 13.5-14 h during panicle development, Thus this sterility may sometimes be compromised be unpredictable fluctuation in temperature and photoperiod .These strict requirements could be seldom fulfilled and this limits two line hybrids rice productions. In contrast, HGMS is not influenced by temperature and photoperiod and so could potentially be used in hybrid rice breeding in areas where the RH is below 60%. HGMS could be applicable to other important crops from grass family such as wheat, barley and maize.

## REFERENCES

Xue, Z., Xu, X., Zhou Y., Wang, X., Zhang, Y., Liu, D., &Qi,X. (2018). Deficiency of triterpene pathway results in humidity -sensitive genic male sterility in rice. Nature communication ,9(1): 604.