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## GRAIN SHATTERING IN RICE

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**G**rain shattering is the process of release of a mature seed from the mother plant which is generally considered an essential mode for survival and dispersal of the seed in the natural environment. Reduction in the shattering of grains is a desirable trait in domesticated crops as it results in increase in yields after harvesting.

Grain shattering in plants is regulated by complex physiological and genetic mechanisms in conjunction with environmental factors (Zhao et al., 2019). Specifically, temperature, humidity and moisture appear to influence it. Grain shattering mainly occurs due to development of an abscission layer located at the junction of the seed base and the pedicel. Highly shattering varieties form a complete abscission layer and low or non-shattering varieties have incomplete abscission layer or it is absent altogether. In recent years, several key genetic factors regulating grain shattering have been identified in crops, and the selection of desirable mutations has promoted crop domestication and improvement by reducing shattering.

### Grain shattering in Rice

In Rice, at maturity grain shattering is a significant problem that is resulting in substantial yield losses to the farmers. Based on shattering percentage the rice varieties can be categorized in three classes viz., low shattering (with shattering less than 5%), medium shattering (with shattering 5-10%) and high shattering (with shattering more than 10%). Grain shattering in rice at maturity during the dry season is causing significant yield losses (200 to 900 kg/ha) to the farmers. This has become a major problem especially in coastal ecosystem where more than 20% yield losses have been reported (Voleti et al 2013).

Understanding the causes, implications, and potential solutions for grain shattering in rice is crucial for improving agricultural productivity and food security.

## **Causes of Grain Shattering**

One of the major causes for grain shattering is the genetic factor. A variety is predisposed to shatter more easily if the strength of the abscission layer, where the grain detaches is less. More importantly Environmental conditions play a crucial role. Environmental characters such as wind, heavy rainfall, and high temperatures can exacerbate grain shattering. Stressful conditions during the maturation phase can weaken the attachment of the grain to the plant. Grains become more prone to shattering at maturity. Delayed harvestings, harvesting of over mature grains is another main reason as the abscission layer weakens over time.

## **Implications of Grain Shattering**

The main implication is seen in the form of yield loss to the farmer as it results in direct reduction of the economic product. This has a significant impact on the rice industry too. Besides higher labour cost to harvest a high shattering rice variety, food security issues where rice is a staple food crop and seed dispersal where it is undesirable especially where controlled harvesting is preferred.

## **Solutions to Reduce Grain Shattering**

The key strategy and the most important solution to the problem of grain shattering is to breed shattering resistant varieties with stronger grain attachment and reduced shattering tendencies. This can be achieved through traditional breeding and gene introgression. Identification of donors with low shattering is required so that they can be utilized in crossing programmes to introgress the trait in modern cultivars. Other methods include using mechanical harvesters that minimize impact on the grains, uniform planting, appropriate fertilization, and irrigation management can help ensure that the rice matures more uniformly, making it easier to harvest at the optimal time.

## **Conclusion**

Productivity and economic gains in most food crops are assessed by their grain yield. Retention of the seed after physiological maturity till harvest is extremely important besides having higher yield attributes. Grain shattering in rice poses a significant challenge to farmers and the agriculture industry. By understanding the causes and implications of this issue, and by implementing effective solutions such as breeding shatter-resistant varieties and

improving harvesting techniques, it is possible to mitigate the impact of grain shattering. These efforts will contribute to higher yields, reduced economic losses, and enhanced food security, particularly in regions heavily dependent on rice as a staple food. Future research should endeavour to understand the ecology, physiology and genetics of seed shattering.

### References

- Zhao Y., Zhang J., Zhang Z., Xie W. (2019). Elymus nutans genes for seed shattering and candidate gene-derived EST-SSR markers for germplasm evaluation. *BMC Plant Bio.* 19:102. 10.1186/s12870-019-1691-4.
- Voleti SR, Raghuv eer Rao P, Jyothi Badri, Subrahmanyam D, Sivarama Prasad S, Swamy KN, Viraktamath BC. Grain Shattering and Dormancy in Rice. 2013. Tech Bulletin No. 67/2013. Directorate of Rice Research, Rajendranagar, Hyd 30, AP, India, pp 52.