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### **Breeding of oilseed mustard: Tales from some marathon runners**

Oilseed mustard is grown in around 6-7 million hectares of land, mostly in the north-western dryland regions of India during the winter season. In 1993 our group made a major observation that hybrids between mustard lines of Indian gene pool and lines of east European gene pool are heterotic for yield. It took about 10 years to develop hybrids DMH-1 and DMH-11. Hybrid DMH-1 is based on a CMS system for pollination control was tested by ICAR in multi-location trials and found superior to best varieties by 15-20% in yield and has been released for cultivation. Hybrid DMH-11 is based on a transgenic system of pollination control. DMH-11 was developed in 2002 and is currently under going biosafety analysis. Given the controversies created around transgenic plants, it cannot be predicted when the technology will reach farmer's field.

Through a combination of conventional breeding and transgenic technologies we have bred mustard lines with high oil and meal quality. This work has required extensive use of molecular markers as linkage drag is a major problem in transferring genes of interest from unadapted germplasm to high yielding Indian varieties. Seven mapping populations have been developed to mark yield related QTL in mustard. Of particular interest are QTL on seed size and oil content. Our earlier mapping work was carried out using AFLP markers, later intron polymorphism markers were used. More recently we have developed SNP markers by transcriptome sequencing using NGS.

There are three major diseases in mustard – Alternaria blight, white rust and stem rot. Germplasm is available for white rust resistance and loci conferring resistance have been mapped. No germplasm is available within Brassica species for resistance to Alternaria and stem rot. Transgenic approaches are therefore necessary to tackle these yield decreasing diseases.

Inspite of recent breakthroughs in NGS technologies and availability of transgenic technologies for quite some time, plant breeding remains difficult due to complex genetics of important agronomic traits and long generation time of crop plants. Some are ready to run in this marathon - but they need backing and clarity in S&T policy.