

Breeding durum wheat genotypes for better grain yield, pasta quality and resistance

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Durum is a cultivated tetraploid species of wheat and is considered superior than bread wheat for the production of semolina and various pasta products. India is one of the leading durum producing countries in the world with an acreage of around 2.5 million hectares and production around 3.5 million tones. In India, durum is traditionally grown mainly under hot and dry conditions of central and peninsular regions. More than 50 years of research has shown that pasta manufactured using vitreous, high protein grains had better cooking quality. Gluten property is an essential factor of cooking quality and high gluten content in grains produce good pasta. In all 30 indigenous varieties were evaluated and it was found that these are poor in beta carotene content (< 6 ppm), test weight (< 78 Kg/hectoliter) and are very prone to grain mottling (> 10% yellow berry grains).these are also susceptible to yellow and black rusts. However several varieties are good in protein content (> 12.5 %). Yellow rust incidence in indigenous varieties was observed to the tune of 80S while in exotic material particularly from CIMMYT, black rust was observed as 60S during the last three years of testing. The disease infestation also deteriorates the seed as well as the pasta quality to a great extent. The semolina recovery in these disease susceptible varieties reduced to 30% in comparison to normal grains giving up to 75%. Keeping all this in view a research program for improving quality of durum wheats was initiated at Directorate of Wheat research, Karnal India. The quality traits viz. beta-carotene, high protein content & test weight, larger grain size and less yellow berry (grain mottling) were taken up for quality improvement.

As a result a large number of genotypes have been identified from germplasm with high quality traits. Through recombination breeding, superior genetic stocks have also been developed. Two genetic stocks, DW 1001 and DBP 01-16 have been developed for better pasta quality and high beta-carotene content, respectively. DW 1001 has the gamma gliadin-45 band which is linked with the best pasta cooking quality. DW 1001 showed significant superiority in yield over durum checks during three years of national testing. This genotype also showed good response to higher inputs and ranked first at various levels of fertilizers doses by giving 2.3 q/ha yield advantage over the best durum check varieties PDW 233 and HI 8498. DW 1001 also showed high resistance to most prevalent brown rust races 77-5 and 77-2 at adult plant stage, besides being resistant to Karnal bunt, powdery mildew and foot rot diseases. Another genetic stock DBP 01-16 has shown beta-carotene up to 9 ppm. Ten improved genotypes of durum wheat developed through breeding exhibited thousand kernel weight up to 64g along with good beta carotene content (> 7 ppm) and less yellow berry incidence (< 2%). To improve the grain size, appearance and tillering durum varieties were crossed with *T. carthlicum* and *T. polonicum* species. In the progeny of interspecific crosses, however, the number of tillers and grain size increased but grains were shriveled. For improving the grain plumpness, 2-3 backcrosses have been made with the recurrent parent. At the same time to study the genetics and identify the molecular markers for quality traits in early generations, the Directorate of Wheat Research has initiated a program to develop Recombinant Inbred Lines (RILs). The contrasting parents for beta -carotene and grain size (thousand grain weight) were selected and crossed to develop RILs. The material is in F₇ generation and phenotyping is in progress.

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