

Genetic Analysis of Rust Resistance Genes in Global Wheat

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Abstract : Three rust diseases: leaf (brown) rust caused by *Puccinia triticina* Eriks, stripe (yellow) rust caused by *Puccinia striiformis* West, and stem (black) rust caused by *Puccinia graminis* f. sp. *tritici* are economically important diseases of wheat in world wide. Yield loss due to leaf rust is 40% in susceptible cultivars. Yield losses caused by the stem rust pathogens in the mid of 20 century reached 20-30% in Eastern and Central Europe and the most virulent stem rust race Ug99 emerged first in Uganda and after that in Kenya, Ethiopia, Yemen, in the Middle East and South Asia. Yield losses were estimated up to 100%, whereas, up to 80% have been reported in Kenya during 1999. In case of stripe rust, severity level has been recorded 60% - 70% as compared to 100% severity of susceptible check in disease screening nurseries in Kenya. Improvement of resistant varieties or cultivars is the sustainable, economical and environmentally friendly approaches for increasing the global wheat production to suppress the rust diseases. More than 68 leaf rust, 49 stripe rust and 53 stem rust resistance genes have been identified in the global wheat cultivars or varieties using different molecular breeding approaches. Among these, Lr1, Lr9, Lr10, Lr19, Lr21, Lr24, Lr25, Lr28, Lr29, Lr34, Lr35, Lr37, Lr39, Lr47, Lr51, Lr3bg, Lr18, Lr40, Lr46, and Lr50 leaf rust resistance genes have been identified by using molecular, enzymatic and microsatellite markers from African, Asian, European cultivars of hexaploid wheat (*Triticum aestivum*), durum wheat and diploid wheat species. These genes are located on 20, of the 21 chromosomes of hexaploid wheat. Similarly, Sr1, Sr2, Sr24, and Sr3, Sr31 stem rust resistance genes have been recognized from wheat cultivars of Pakistan, India, Kenya, and Uganda etc. A race of *P. striiformis* (stripe rust) Yr9, Yr18, and Yr29 was first observed in East Africa, Italy, Pakistan and India wheat cultivars. These stripe rust resistance genes are located on chromosomes 1BL, 4BL, 6AL, 3BS and 6BL in bread wheat cultivars. All these identified resistant genes could be used for notable improvement of susceptible wheat cultivars in the future.

Keywords : hexaploid wheat, resistance genes, rust disease, *triticum aestivum*

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