CHAPTER 6

Summary & Conclusions
6. SUMMARY AND CONCLUSIONS

The studies presented in this thesis relate to the investigations on leaf rust resistance in durum wheats. Pathotypes of standard race 77 of leaf rust were selected because these are the predominant group in almost all parts of the country for the last several years. The following aspects were studied:

i) variability in durum wheat germplasm for resistance to leaf rust pathotypes at seedling stage,

ii) adult plant resistance to race 77 in durum wheats, and

iii) inheritance of leaf rust resistance in durum wheat for selected pathotypes.

From the durum wheat germplasm maintained at this Institute, 396 accessions of diverse origin were selected and tested with five pathotypes of race 77, viz. 77(45R31), 77A(109R31), 77A-1 (109R23), 77-l(109R63) and 77-2 (109R31-1) at seedling stage for identifying the resistant stocks.

The same set of accessions was also tested for adult plant resistance to race 77 in an isolated nursery to identify lines that showed field resistance at mature stage and find out if any of them carry adult plant resistance (APR) genes.

In both seedling and adult plant tests, a set of near-isogenic Lr gene stocks and standard differentials was also tested to test the virulence of the pathotypes and make an attempt to postulate the probable genotypes of the durum wheat accessions.

Five resistant durum varieties, viz. Malavika, CPAN 6051,
CPAN 6079, Raj 1555 and Malvi local were crossed to a susceptible variety MACS 9 and genetics of leaf rust resistance was studied by testing $F_1$, $F_2$ and backcross $F_2$ progenies with pathotypes 77, 77A and 77-1. The goodness of fit to theoretical ratios and independence of genes was tested using $X^2$ test. Salient observations are summarised below:

I. Variability for leaf rust resistance at seedling stage:

i) The virulence/avirulence pattern of the pathotypes on Lr lines indicated that most of the Lr genes, except those of alien origin were susceptible to these pathotypes, confirming earlier observations on the virulence of race 77 and its pathotypes. Only Lr10 with race 77, Lr23 with 77-1, Lr2a and Lr30 with 77-2 and Lr20 and Lr23 with 77A-1 showed resistance. None of the Lr lines derived from within the wheat varieties showed resistance to pathotype 77A.

ii) On the other hand, a number of durum wheats showed resistance to one or more of these pathotypes. The number of accessions showing highly resistant to moderately resistant reaction (0, 0; 1, and 2 infection types) were: race 77- 150; pathotype 77-1- 155; pathotype 77-2 - 175; pathotype 77A- 133; pathotype 77A-1- 118.

iii) It was interesting to note that 38 accessions showed resistance to all the five pathotypes used, which included some Indian local varieties. Since, none of the known Lr genes or gene combinations could account for resistance to all the pathotypes, it was concluded that these accessions may carry
additional resistance genes, which should be of value for both durum and bread wheat breeding.

II. Adult plant resistance in durum wheats:

i) Of the 362 durum varieties tested with race 77 for resistance at adult plant stage, 195 showed resistance both at seedling and adult plant stage, while 37 varieties were susceptible as seedlings but resistant at adult plant stage. Twelve varieties, viz. Wells, Langdon, Valgiorgio, Hymera, Dier Allah, Israel durums-1960, 2712, 15157, 15160, RT 232F, RT 233 and RT 346 were susceptible in seedling stage to all pathotypes, but showed resistance to low disease severity at adult plant stage to race 77. These varieties may possibly carry APR genes.

ii) Postulation of probable genotypes was attempted using the seedling reaction types and adult plant reactions. This could be done for 163 varieties. A majority of them carried Lr10 or combination of Lr10 with other genes. Wherever seedling reaction suggested Lr10, but adult plant reaction was better than Lr10, it was concluded that Lr13 or gene (s) with similar effect may be present.

III. Genetics of leaf rust resistance:

i) Genetic studies indicated that unlike in bread wheats, resistance in durum wheats is mostly recessive in nature. Malavika carried on dominant gene for race 77 and one recessive gene for race 77, 77A and 77A-1. Resistance in CPAN 6051, CPAN 6079 and Raj 1555 was due to one recessive gene effective against the three pathotypes. Malvi local showed two
dominant genes for race 77 and one dominant gene for race 77A and 77A-1.

ii) Crosses of the resistant accessions with some of the Lr lines indicated that one of the genes in Malvi local may be Lr10. None of the other genes were could be assigned to the known Lr genes.

iii) Crosses among some of the resistant accessions showed segregation of susceptible plants, indicating that they possess different genes.

These studies emphasized the diversity of leaf rust resistance genes in durum wheats. They can be used as a method of creating genetic barriers for currently predominant pathotypes, as they possess better resistance than bread wheats. They can also be used as source of diverse resistance genes to improve the leaf rust resistance of bread wheats.

It has been suggested that, for a better understanding of leaf rust resistance in durum wheats, samples from durum wheats may be separately analysed for pathotype characterisation. It is also essential to develop a differential set based on durum wheats, preferably near-isogenic lines in a susceptible durum background. Only then can the nature of inheritance of leaf rust in durum wheats can be properly understood.