Qualification and utilization of the within a landrace genetic variability

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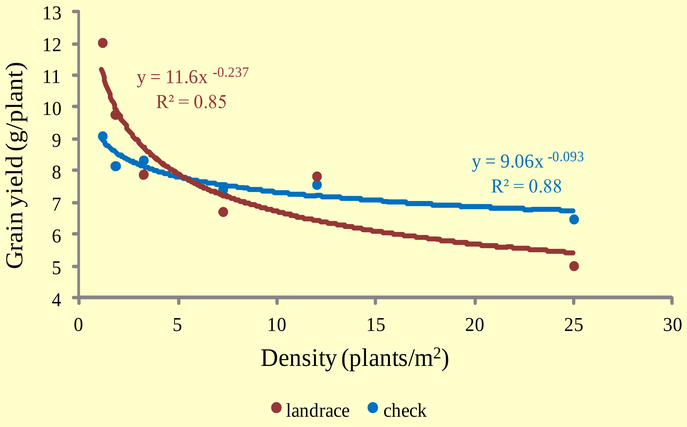
Introduction

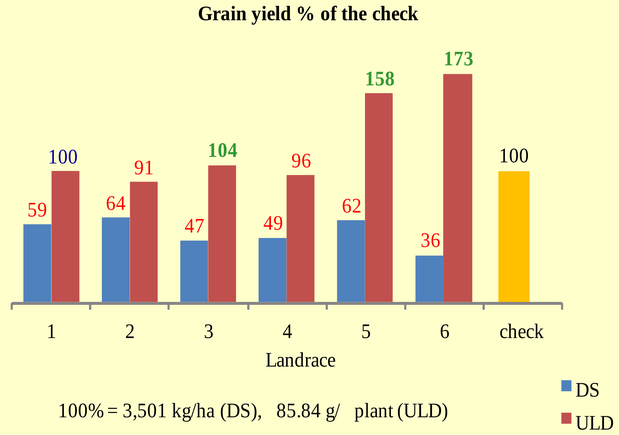
Landraces of self-pollinated crops → 1-2 selection cycles → Pure-line varieties

Landraces of predominantly self-pollinated crops consist of genetically homogeneous individuals. Therefore, they are unique genetic resources and single-plant selection for 1 or 2 rounds may lead to good pure-line varieties.

Negative relationship of yield with competitive ability imposes ultra-spaced plants to qualify and utilize the 'landrace' gene pools

Landrace qualification

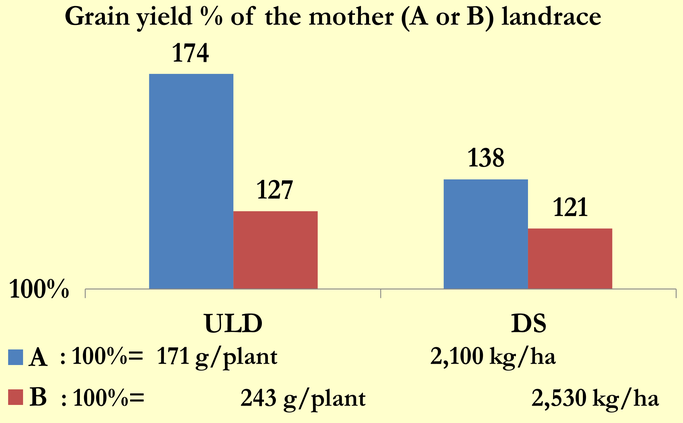




The inverse yield performance of an heterogeneous landrace versus an homogeneous check cultivar at the ultra low density (ULD) compared to the dense stand (DS) mirrors a negative relationship between yielding and competitive ability of individual genotypes. *Leftwards*: The vetch landrace lagged significantly behind the check by 29%, at the highest crowding level , but at the lowest crowding level exhibited a 32% superiority [1]. Rightwards: in comparison with the check, two wheat landraces (i.e., 5 and 6) yielded 38 and 36% lower at DS and 58 and 73% higher at ULD [2]. For the landrace, at one extreme of high densities plants that represent strong competitors but low yielders mask the capacity of the high yielders. At the other extreme of absence of competition the role of the competitive ability is negligible, hence, high yielders fully express their yield potential. Conclusively, landrace qualification as potential breeding source is a matter of absence of competition. The same applies for recognition of the outstanding genotypes, and the following two case studies are supporting.

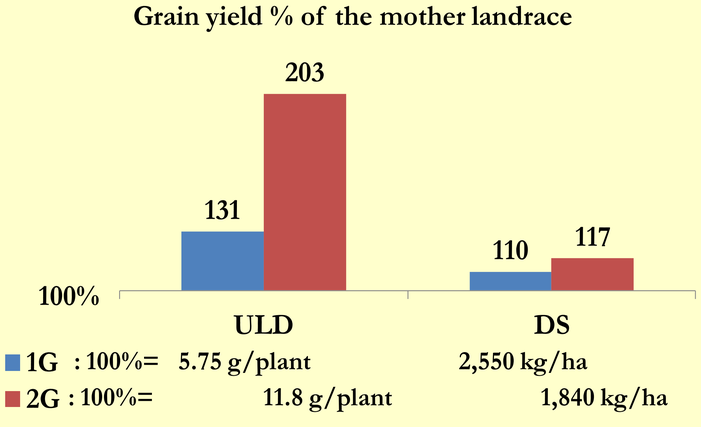
Landrace utilization

Bean case study



Breeding within two landraces (A and B) in a greenhouse to simulate heat stress and in an open field led to 19 single-plant sister lines [3]. The top ranking A sister line averaged 74 and 38% higher yield than its ancestor at the ULD and DS, respectively (Fig. 1). The respective values for the top ranking B sister line were 27 and 21%. There was an evidence of addressing the GxE interaction towards high and stable productivity. The above B sister line was registered under the name "Prespa", and there is a hearsay evidence drawn from growers that performs well even during fairly hot growing seasons. A high correlation between yield at ULD and TS of 21 sister lines was significant (r=0.71, P <0.001).

Lentil case study



Breeding at ULD was performed for two generations within a landrace, assuming that favours increased virus spread and facilitate recognition of susceptible genotypes [4]. Sister lines were consistently more uniform and higher yielding than the mother landrace. The top 1st generation (1G) sister line was by 31 and 10% superior over its ancestor at the ULD and the DS, respectively. Its four progenies (2G) averaged 103 and 17% higher yield than the mother landrace at the ULD and the DS, respectively. The highest-yielding plants were free of the viruses detected during experimentation. A moderate correlation between yield at ULD and TS of 21 2nd generation lines was significant (r=0.45, P<0.05).

References

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