

Genetic gain in yield and changes associated with physiological traits in Brazilian wheat during the 20th century

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The objective of this study was to characterize physiologically wheat cultivars released in different decades and identify selection criteria for the continued genetic progress in Brazil. Ten cultivars released from 1940 up to 2009 were tested during 2010 and 2011 crop seasons. The following traits were evaluated: grain yield (GY), thousand-kernel weight (TKW), grain number per m^{-2} (GN), plant height (PH), harvest index (HI), above-ground biomass (BIO), relative Chlorophyll content and leaf gas exchanges. The increase in grain yield was $29 \text{ kg ha}^{-1} \text{ yr}^{-1}$ a genetic gain of 0.92%, annually. Grain yield improvement was largely associated with HI (0.94**), number of grains m^{-2} (0.93**), BIO (0.88**) and reduced PH (-0.93**). The post-anthesis Chlorophyll content, stomatal conductance and pre/post-anthesis photosynthetic rate were positively correlated with GY. Genetic gains of Brazilian wheat are mainly related to the increases of HI, GN, and BIO. These improvements were achieved by reducing PH and raising gas exchanges and chlorophyll content.

Outcomes and Prospects:

- The grain yield achieved in Brazil in the last years was impressive, due to the use of more inputs and the efforts of plant breeders in the development of the crop.
- The increase in above-ground biomass was largely related to higher photosynthetic rate, stomatal conductance and leaf Chlorophyll content.
- Further improvements of grain yield may be achieved by increasing the photosynthetic capacity, optimizing biomass production and maintaining lodging tolerance.

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