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Improvement in Protein Quality of Waxy Maize for South East Asia by Doubled Haploids and Marker Assisted Selection

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Abstract

Starch of waxy maize basically is characterised by 100% of amylopectin (absence of amylose). Like conventional maize its nutritional value is relatively low due to low content in lysine, tryptophan and threonine, which are essential amino acids regarding human nutrition. Thus, infant malnutrition is a major issue in margin regions of South East Asia (SEA), where waxy maize is the staple food. This study aimed to develop waxy maize of acceptable agronomic and organoleptic properties with higher protein quality by combining existing waxy cultivars with Quality Protein Maize (QPM) lines developed by CIMMYT. QPM is controlled by the recessive gene *opaque2*, responsible for higher lysine and tryptophan contents, and genetic modifier genes impacting physical kernel properties like hardness. *In vivo* gynogenesis by the mean of inducer lines, kindly provided by University Hohenheim (Germany), principally should permit to rapidly obtain doubled haploids (DH) originating from [*waxy**QPM] hybrids. Even though initial difficulties were encountered in adapting the DH-technique to sub-tropical maize genotypes (*e.g.* interference in anthocyanin pigmentation), finally the mean haploid induction rate (8.2%) and the mean chromosome doubling rate (40%) were relatively high. However, the fitness and fertility of DH were rather low, leading often to low seed set (19% of the plants in average). Specific molecular markers developed for *waxy* (*wx*) and *opaque2* permitted to identify several double recessive waxy-QPM DH, which represent a valuable base for classical breeding of protein improved waxy maize for SEA. These doubled haploids had almost 100% amylopectin starch and had a much increased lysine content as well. But the hardness and vitreous endosperm trait specific to QPM maize seemed to be lost possibly due to the *waxy* gene.

Keywords: Doubled haploids, maize, *opaque2*, QPM, waxy