

Peeranuch Jompuk 2007: Improvement of Quality Protein Maize using Marker-Assisted Selection (MAS). Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Associate Professor Wasana Wongyai, D.Agr. 68 pages.

Quality protein maize (QPM) controlled by *opaque-2* (o_2o_2) gene can help alleviate human malnutrition and reduce costs of animal feed because it contains higher tryptophan and lysine content in endosperm than normal maize. The *opaque-2* gene could be detected by molecular marker. The objectives of this study were to (i) improve inbred lines for quality protein maize (QPM) using marker assisted selection (MAS) and (ii) estimate general and specific combining ability (GCA and SCA) of QPM inbred lines. Three populations, Pop61C₁, Pop62C₆ and Pop65C₆ developed by the International Maize and Wheat Improvement Center (CIMMYT) were used. S₀-plants of preferred morphological characters were self-pollinated to produce S₁ to S₃ lines. For S₁-seed, the average tryptophan content in endosperm of QPM and non-QPM as detected by phi057 marker was 0.66% (for QPM), 0.38% (for non-QPM), 0.38% for Suwan 1 (a non-QPM) and 0.80% for the Opaque-2 standard variety. Moreover, those QPM and non-QPM plants detected by phi112 showed the same result of total protein and tryptophan content in endosperm. Ten S₃ inbred lines were examined for the *opaque-2* gene using the phi057 marker and they were crossed in a diallel method. The protein content in endosperm of these inbred lines, Opaque-2 and Suwan 1 had no significant differences among them. On the other hand, tryptophan content was significantly different. Results studied on grain yield of 45 F₁ hybrids showed that the superior tested hybrid gave 6.10 t ha⁻¹ which was not significantly different from the non-QPM hybrid. Protein content was not significant among tested hybrids, QPM population and non-QPM hybrids. Tryptophan content in endosperm of tested hybrids was higher than non-QPM. Inbred P10 had the best combination of GCA effects for grain yield. Moreover, inbred lines, P1, P7, P8 and P9 also gave positive GCA effects. Therefore, these inbred lines can be used as tester lines for the quality protein maize program or the positive GCA effect lines could be used as the lines to form new quality protein maize populations. The results showed that it would be developed QPM inbred lines from the cross P9 x P4. In addition, the best QPM hybrid could possibly be grown in Thailand without any differences in grain yield and has a greater advantage, in terms of grain nutrition, than normal maize.

Peeranuch Jompuk
Student's signature

Wasana Wongyai 8 / May / 2007
Thesis Advisor's signature