

Angkana Poniyom 2011: Waxy Corn Improvement for High Quality Protein Using Marker-Assisted Selection of *Opaque-2* and *Waxy* Genes. Master of Science (Agronomy), Major Field: Agronomy, Department of Agronomy. Thesis Advisor: Assistant Professor Choosak Jompuk, Dr.sc.nat. 71 pages.

The waxy corn has in a low quality protein which is deficient in essential amino acids, lysine and tryptophan as compared to that of normal corn. However, this problem can be solved by incorporating the *opaque-2* mutant gene causing higher lysine and tryptophan in the endosperm about two times. The purpose of this study was to transfer the *opaque-2* gene from the quality protein maize (QPM) inbred line to the waxy inbred lines by crossing. The waxy lines, Kwi1 and Kwi9 was used as a female and QPM line, Q53 (PopII#53) was used as male. Moreover, simple sequence repeat markers (SSR markers) was applied to detect the *opaque-2* and *waxy* genes in the segregating population (BC_1F_1 , BC_1S_1 , BC_1S_2 and BC_1S_3) where the *phi057* and *phi022* detected the *opaque-2* and *waxy* genes, respectively. In the BC_1F_1 generation, plants segregated into homozygous dominance and heterozygous of these two genes. Only heterozygous plant of these genes was used to make backcross to its recurrent parent. In BC_1F_1 plant, *phi057* was applied to detect the heterozygous of *opaque-2* plants (O_2o_2) and these plants were self-pollinated to achieve the BC_1S_1 . Then, advanced generations were done by selfing the selected plants into BC_1S_3 . In this generation five homozygous recessive of both *opaque 2* and *waxy* genes ($wxwxo_2o_2$) were detected by *phi057* and *phi022*, respectively. At 21 after pollination, amylopectin in endosperm of these lines ranged from 95.55-97.54% while tryptophan content in protein ranged from 0.82-1.31%. Moreover, protein content ranged from 7.98 to 10.41%. These results indicated that *waxy-opaque-2* inbred lines gave high tryptophan content as *opaque-2* corn and high amylopectin as waxy corn. Likewise, ten F_1 hybrids from the diallel cross of BC_1S_3 inbred lines showed not only high amylopectin but also high tryptophan content in endosperm. For combining ability, A1 line had the best general combining ability (GCA). The cross of A1 x A3 gave the highest green ear weight (2,251 kg/rai) and white ear weight (1,702 kg/rai). These results indicated that *waxy* and *opaque-2* genes can be combined in a plant whereas tryptophan content and amylopectin can be expressed as a normal function of those genes separately.

Student's signature

Thesis Advisor's signature