Local rice (*Oryza sativa* L.) generally carry high genetic variation and it is important as genetic resources for disease and insect resistance gene. Muey Nawng (MN) is local glutinous rice that is the most popular in northern Thailand where there is a serious problem with insect pest, rice gall midge (*Orseolia oryzae* Wood-Mason). The objectives of this study were to determine genetic diversity of MN populations and to evaluate yield and resistance to rice gall midge in locations where the rice gall midge damages occur regularly. Two experiments were conducted in this study.

The first experiment was to determine genetic diversity within and among populations of MN collected from different regions in the northern Thailand. Eighty-two seed lots were collected from farmers in Mae Wang, Mae Rim, Chiang Dao, Chaipragarn of Chiang Mai Province, Pai of Mae Hong Son Province and Bor Glua of Nan. The seed lots were evaluated at Agronomy Department, Faculty of Agriculture, Chiang Mai University. In experiment 1.1, morphological characteristics in farmers' seed lot were determined. For each seed lot, determination was made on 100 seed size, shape, hull color, pericarp color, iodine staining and gelatinization temperature (with alkali spreading test) of the endosperm (milled rice). In experiment 2, progeny testing was conducted by sowing 83
individual seed lots in pots, 20 plants per seed lot. At tillering, leaves were collected for DNA analysis. Leaf samples were collected randomly from 10 individual plants per seed lot, 18 seed lots for DNA analysis using 5 microsatellite markers. Plants were measured for 14 morphological characters at flowering and maturity. Morphological variation within population was assessed using Shannon-Weaver index ($H'$). Molecular diversity was determined and dendrogram was constructed by UPGMA method.

Morphological variation between and within populations were found in local MN populations. In the experiment, the variation was found within and among seed lots, there were seed shape (0-5%), pericarp color (0-30%), and non-glutinous rice (0-60%). These variations occurred due to diversity within the variety and contamination in farmers' seed lot, especially slender seed shape and non-glutinous rice. Progeny testing in experiment 2 showed variation within and between populations both in morphological characters and molecular level. Fourteen morphological variation characters classified populations into 53 types. Each local MN contained 2 to 31 types within population. For molecular analysis, genetic differentiation among populations ($G_{st}$) was 0.227 indicated that three quarters of total genetic differentiation (77.3%) was genetic differentiation within population and only one quarter was distributed among populations. Considering genetic diversity within local MN populations, ten morphological characters showed high variation with Shannon-Weaver index ($H'$) were in rage of 0.1192 to 4.1569. Twenty-six polymorphic alleles (5.2 alleles per locus) and heterozygosity (h) = 0.112 were detected by DNA analysis.

The second experiment was to determine grain yield and resistance ability of local MN to rice gall midge in farmers’ field. Seven populations of local MN collected from different location. Three improved varieties, Muey Nawng 62M (rice gall midge resistant variety selected by Sanpatong Rice Research Institute), RD6 and Sanpatong1 (rice gall midge susceptible variety) were included as standard checks. Experiment 2 was field experiment in 2004, ten rice populations were grown in three villages 1) Ban Maemoott, Mae Wang. 2) Ban Narcun and 3) Ban Maeming, Mae Chaem, Chiang Mai province. Experiment 2.2 was field experiment in 2005, ten rice populations were grown in five villages 1) Ban Maemoott, Mae Wang, 2) Ban Narcun and 3) Ban Maeming, Mae Chaem
4) Ban Meungkong, Chiang Dao, Chiang Mai province and 5) Samaksanpakorn, Mae Sod, Tak province. The experiments were in Randomized Complete Block (RCB).

In the experiment 2.1, all 7 local MN populations produced less silver shoot, indicator of rice gall midge infection, and had higher grain yield than check varieties. Local MN from Samerng and Maemoot showed no percentage of silver shoots per plant and the highest yield was found in MN from Samerng (1,026 kg/rai). The experiment 2.2 showed that MN populations produced less silver shoot and produced higher yield than Sanpatong1 and RD 6. Local MN from Samerng showed the least percentage of silver shoots per plant. Local MN from Maemoot #1 and 3 produced the highest yield (1,013 kg/rai)

These studies were concluded that high genetic diversity between and within populations existed in local MN populations collected from 8 locations. In addition, locally, genetically diverse MN populations had lower level of gall midge infestation and higher yield than purified, improved varieties when grown in areas where rice gall midge is a limiting factor.