Reduction of Chemical Fertilizer Usage in Mandarin Orchard and Effects on Yield and Quality of Mandarin Fruits: On Farm Trial at Fang District, Chiang Mai Province

Vassana Viroonrat1*, Kritsadaporn Sangsawang 2, Ampan Bhromsiri1 and Thaworn Onpraphai1

1Department of Plant Science and Natural Resources, Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200, Thailand
2Pong Num Ron sub-district, Fang district, Chiang Mai 50110, Thailand

*Corresponding author. E-mail: virunrat@gmail.com

ABSTRACT
A field experiment was conducted in mandarin orchard of a farmer in Fang district, Chiang Mai province in order to evaluate the effects of reduction of the chemical fertilizer usage on yield and quality of mandarin fruits. The soil in the orchard had pH of 5.0 and contained high level of soil organic matter (2.5-3.0%), very high level of available P (>100 mg P/kg) and high level of exchangeable K (100-300 mg K/kg). The experimental design was randomized complete block with 5 replications and 4 treatments. In the first treatment, soil application of N, P and K fertilizers including foliar spraying of fertilizer according to farmer practice (NPK+FL) was used. In the second, third and fourth treatments, soil application of P and K fertilizers were omitted. In the second treatment, the same rates of N and foliar fertilizer spraying were the same as those in Tr.1 (-PK+N+FL). In the third treatment, the same rate of N fertilizer as used in Tr.2 was applied but foliar fertilizer was used according to the data of leaf analysis (-PK+N+fl). In the fourth treatment, the same rate of foliar fertilizer spraying as used in Tr.3 was applied while N fertilizer was applied according to N removal by fruit yield plus additional N to compensate N lost by leaching about 40% of N removal by fruit yield (-PK+n+fl). The collected data were, in season fruit yields harvested in December 2008 and January 2009, fruit sizes and the content of soluble solid of the fruits. It was found that in Tr.1, the total fruit yield was 80 kg/tree of which 56% were no.5 size and those with no.6 and no.4 sizes were 19 and 16% respectively. The content of soluble solid was 10.8 °brix for the fruits in the first harvest while those in the second harvest were 11.5 °brix. There were no significant differences of fruit yields and fruit qualities among the four tested fertilizer application rates. In Tr.2, the cost of input on fertilizer application could be reduced 57% compared to that of Tr.1 while in Tr.3 and Tr.4 the costs of inputs were reduced 88 and 97%.

Key words: Mandarin orchard, Reduction of chemical fertilizer, Soil and foliar application, Fruit yield, Fruit quality

INTRODUCTION
Chiang Mai province is the largest mandarin (Citrus reticulata Blanco) producing area of Thailand. The total cultivated area in 2009 is 67,221 rais (10,755.36 ha) which 94% are in Fang, Mae Ai and Chaiprakarn districts. Ninety six percent of the farmers grow ‘Sai Nam Pueng’ mandarin variety. At present, mandarin cultivated area has been reduced compared with that in 2007 due to the low price of mandarin fruits particularly at the time of the high peak of fruit production, reduced market share due to imported citrus fruits, less demand from overseas markets, high cost of inputs and environmental problems from over doses of agrochemical application (Chiang Mai Agricultural Office, 2009). From the study of Virunrat et al. (2011) the status of soil fertility and plant nutrient contents of the leaves of mandarin trees in the orchards of fifty farmers at Mae Soon