

ABSTRACT

Arabica coffee cultivation system under the natural resources conservation is the 3rd year of a 4 years research project. The main objectives of the project are (1) to study new grown Arabica under shade with soil and water conservation. (2) to study the best practices in coffee growing under the shade of full canopy coffee plantation. The 1st experiment is new coffee plantation at Ban Pakluay-khunya, under the cooperation program between The Royal Project and Thai Petroleum Public Company Limited. The plots use for 2nd research were full canopy located at Development Center or Station Pa Miang, Teen Tok, Inthanon, Khun Chang Khian and Nong Hoy. Monitoring every plot monthly, measurement plant growth and assessment pest and disease. This paper present the microclimate of shade and sun grown. Plant growth, some physiology respond, coffee quality and growth of new plantation with soil and water conservation plots.

Growth of the 1st experiment, (1) T1 full sun grown coffee, farmer's management without conservation (control). T2 full sun grown coffee with shade tree, management with consulting from technician of the project. T3 coffee grown under natural or grown shade, consulting from technician of the project. Data in September 2018, T1, T2 and T3, stem diameter was 2.47, 3.29 and 2.52 cm respectively. Plant height was 91.3, 118.6 and 111.2 cm respectively. The 1st branch was 27.3, 38.9 and 30.4 branches per tree respectively. The relative growth rate (RGR) of stem diameter was 0.042, 0.035 and 0.034 cm/cm/month respectively. RGR of plant height 0.047, 0.039 and 0.044 cm/cm/month respectively. And the RGR of 1st branches 0.071, 0.052 and 0.047 branch/branch/month respectively.

The 2nd studying, all year round temperature and air humidity average 14.26-24.09 °C and 59.33-96.79% respectively. Sun grown had higher temperature and lower humidity. Average leaf area per leaf was 59.77-136.94 cm². Leaf dry weight per leaf was 0.49-1.38 g, SLA was 44.79-170.01 cm²g⁻¹, leaf from shade grown had more leaf area, leaf dry weight and SLA. For SLW was 6.62-22.77 mg cm² sun grown get higher than shade grown. SLA and SLW use for predicting the photosynthesis and partitioning. Leaf nutrient content found N 1.83-3.07%, Mg 0.011-0.230%, shade grown higher both N and Mg. P K

and Ca not significant differences, but they were lower than the standard nutrients concentration in coffee leaf.

Average weight of 100 cherries was 149.33-191.67 g, sun grown always higher than shade grown. Weight of 100 parchment coffee was 19.55-22.43 g, not significant difference between sun and shade grown. For green bean 100 bean weight 15.92-19.98 g, sun grown heavier than shade grown. Chemical composition, caffeine, chlorogenic acid and trigonelline were analyzed from green bean and roasted coffee with the High Performance Liquid Chromatography (HPLC). For green bean caffeine was 1.35-1.40%, Chlorogenic acid was 4.94-5.84% and Trigonelline was 0.96-1.23%. Sun grown was found more Caffeine and Trigonelline. While shade grown was found more chlorogenic acid. For roasted coffee it was found Caffeine 0.57-1.03%, Chlorogenic acid 0.68-1.49% and Trigonelline 1.31-1.82%. Sample from sun grown from Pa Miang and Teen Tok had higher Caffeine, Chlorogenic acid and Trigonelline than from the shade grown. But sample from shade grown from Inthanont, Khun Chang Khian and Nong Hoy had higher Caffeine, Chlorogenic acid and Trigonelline than sun grown.

It could be concluded that, 1st studying that was in new coffee planting with the conservation methodology. The more intensive management the more growth and development of coffee trees. Coffee with intensive management resulted in uniformity and resistance to pest. Coffee with less intensive management found nutrients deficiency and green scale insect, ant and black mold. The 2nd studying need to explain the management and resulted of sun and shaded grown on morphology, physiology growth, development, yield and quality of coffee. It need more information in long term.

Keywords: Arabica coffee, Soil and water conservation, Agroforest, Microclimate