

Organic Farming System and Differentiation of Sulloc Tea Garden in Jeju

Jin-ho Lee¹

Key words: Sulloc Tea Garden, Organic farming, Differentiation, Food safety

Introduction

Sulloc Tea Garden was established with the intent to revive Korean tea culture and contribute to agricultural development by Pacific Group from 1980. Sulloc tea garden has a total of four tea gardens, three tea gardens of which are located in Jeju Island and one tea garden in Jeollanam-do. The planting area is approximately 175ha and annual tea production is about 600 tons. We put an emphasis on increasing productivity in the 1990s, and have done our best for the improvement of quality and safety since the year 2000. We introduced the world's first HACCP system to tea garden and factory, and obtained the first certification of GAP from the Korean government. Also, we introduced an organic farming system with intent to take the lead in protection of the environment and provide safer tea to customers from 2004. All Sulloc tea gardens were cultivated by organic farming despite large scale area now. We obtained the organic certification of IFOAM and USDA for advancing into the global marketplace in February, 2010. In this presentation, I would like to take this opportunity to introduce safe production system and organic farming of Sulloc tea garden to you.

Organic farming system of Sulloc tea garden

1. Organic farming system in disease and pest control

Thirty kinds of insects have been reported as pests damaging to tea plant in Korea. Major major pests are tea green leafhopper (*Empoasca onukii*), yellow tea thrips (*Scirotothrips dorsalis*), tea red spider mite (*Tetranychus kanzawai*), oriental tea tortrix (*Homona magnanima*), and horned wax scale (*Ceroplastes pseudoceriferus*). But we are having troubles with new insect pests, tea-bag worm (*Eumeta minuscula*) and *Geisha distinctissima* which never seen in conventional culture until recently before turning over to organic farming. Major diseases are anthracnose (*Colletotrichum theae-sinensis*), gray blight (*Pestalotiopsis longisetata*), and blister blight (*Exobasidium vexans*), have especially causing the great damage to the tea plant. Organic farming is very difficult work in large tea gardens because there are many diseases and pests and then, much patience and high technical farming skills are required in the organic farming of tea garden. We are using natural substances spraying, pheromone, and pruning as agronomic practices for control of insect and disease pests. We investigated the effects of natural substance and natural extracts sold in the market on insect pest in vitro experiments and field instead of insecticide. Figure 1 indicates the control efficacy of natural materials on pest in Sulloc Tea Garden. We are having a lot of troubles in selecting natural substance for effective disease control, specially for effective control of anthracnose by eco-friendly organic material.

¹ Sulloc Green Tea R&D Center, Jangwon Co. Ltd., Seogwipo 697-920, Korea. E-Mail: jhlee@jwgreent.co.kr

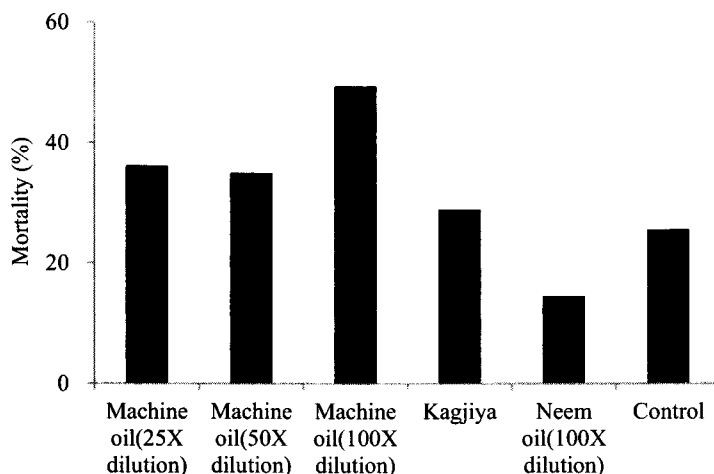


Figure 1: Control efficacy of a few organic materials on over-wintering horned wax scale in the field.

We are using two pheromones of attractant and mating disruptor for control of moths increasing. A mating disruptor pheromone is set by 250 pieces per 10a, once a year in March, so it costs a lot but it is highly effective. If natural substance spraying and pheromones are ineffective on pest control, we use a pruning technique which deeply cut tea branch as agronomic control. A pruning technique is an agronomic control, cutting out tea branches and leaves which are the pests' primary food. We regularly prune tea plant at the height of 10 cm below the second crop tea's plucking surface in July shortly after the harvest of second crop tea. Figure 2 indicates that tea plant pruning is very effective on anthracnose control.

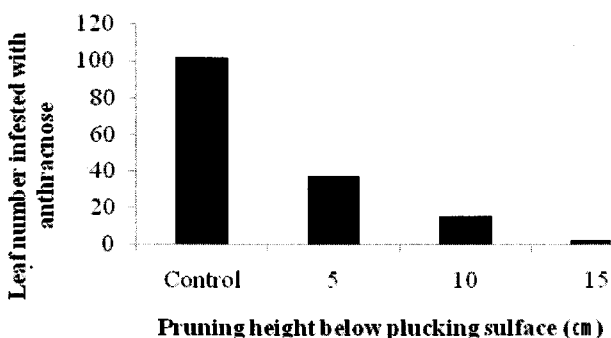


Figure 2: Leaf number infested with anthracnose as influenced by pruning height below plucking surface in July shortly after the harvest of second crop tea.

2. Organic fertilization system

We use only organic fertilizer in Sulloc tea garden's farming because chemical fertilizer is undesirable in organic farming. Organic tea farming requires more fertilization cost because the tea plant is a heavy dressing crop. If the amount of applied fertilizer is decreased to cut costs, it reduces tea quality. So we continue to

apply organic fertilizer for tea quality despite the cost increase. Natural organic fertilizers we are using are guano, rapeseed meal, soybean meal, castor meal and bone meal in our tea garden. This fertilization system is designed with fertilizer acting speed and ingredients proportion of organic fertilizers. Also we are using organic liquid manure made from seaweeds such as *Enteromorpha*, *Ecklonia cava*, and sea fish such as hairtail, and mackerel for the tea's aromas and flavors. We made these liquid manures by ourselves through lactobacillus fermentation for one year. And we continue to analyze tea taste component as influenced by method of fertilizer application for differentiation of tea quality. Figure 3 indicated tea taste compound contents as influenced by soil drench of organic liquid manures in Sulloc.

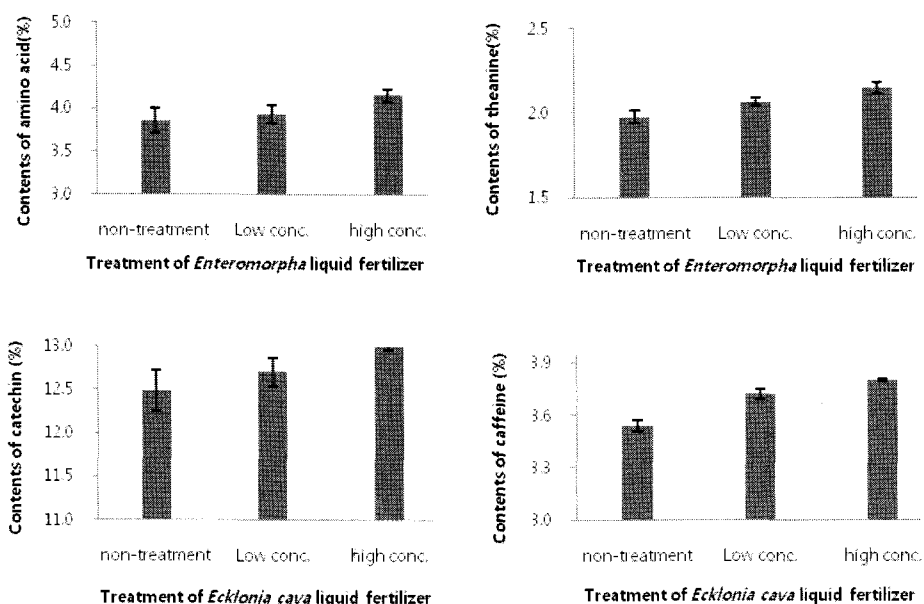


Figure 3: Taste compounds content of first crop tea as influenced by soil drench of organic liquid manures.

We regularly continue to check soil nitrogen movement and soil acidity, and divide split application considering soil nutrient condition by six times for sustainable fertilization system of organic tea garden. Soil acidity was corrected by application of magnesium calcium fertilizer in case its pH level drops below 4.2. Soil condition of Sulloc tea garden is always maintained at a suitable level for tea growth by these soil improvements. Also we continually provide grass mulch and woodchip for improvement of soil physical property such as air permeability and permeability.

3. Organic farming in weed control

Jeju's mild sub-tropical weather causes many weeds to grow. The major weeds of Sulloc are *Stellaria media*, *Lamium amplexicaule*, *Digitaria sanguinalis*, *Taraxacum officinale* and *Galium spurium*. We remove all weeds by hand and weeder machine in Sulloc tea garden's farming because chemical herbicide is unavailable in organic farming. We are working on weeding seven to eight times a year. So weeding work requires cost in all farm works. We raise cover crops on embankment and farm road around such as *Lampranthus spectabilis*, *Centella asiatica* for reducing cost and labour. And we sometimes use black mulching film in young tree field.

4. Differentiation of Sulloc tea

Sulloc tea garden has been blessed by heaven for cultivation of the tea plant. Our tea garden's weather condition is suitable for growth and development of tea (as subtropical perennial crop), because the annual mean temperature is about 16.5°C, the effective accumulated temperature is about 2,200°C, and the annual minimum temperature is over -5°C in Seogwipo. Also, soil conditions with high soil organic matter content, good aeration and water permeability and annual precipitation over 1,800 mm is suitable for tea plant growth. These natural environments help to improve tea quality. For this reason, the tea leaves of Sulloc tea garden have an abundant taste compounds. Unlike general tea, Sulloc tea has high quality and high healthful functionality because it has not only high free amino acid content but high catechin content. Tab. 1 indicates the comparison of taste compound content between Sulloc tea and Japanese tea.

Tab. 1: Ingredient content of first crop tea leaves in Sulloc tea and Japanese tea. Data are means of 100 samples manufactured in Jeju and Shizuoka from 2007 to 2008 respectively.

Tea samples	Ingredient content (%)					
	Total nitrogen	Total free amino acids	Theanine	NDF fiber	Catechin	Caffeine
Sulloc tea	5.37	3.25	1.60	21.23	14.32	3.74
Japanese	4.98	2.53	1.41	20.92	13.38	2.64

Food safety management system of Sulloc tea

Sulloc tea manufacturing plants are managed by HACCP and organic food certification system. All four plants were certified for HACCP by the FDA of Korean government in 2003, and for Organic Processing Food System by the Korean government in February, 2010. Our plants are partitioned off an area of tea manufacturing lines into three districts such as pollution, non-pollution, and cleanness, and are divided up into worker passage and product passage for preventing cross-contamination. The manufacturing processes involving a potential of hazard such as bacteria, pesticide residue and metals are intensively managed by regular monitoring. And the results of monitoring are recorded by documentation.

Conclusion

Organic farming needs much more efforts, higher cultivation techniques and stronger worker's will. Sulloc tea garden will continue to work toward safety improvement and customer satisfaction of all Korean tea with continuous technical innovation and edification.

Reference

- Kim, D.I. (2003): Pest control technology for the direct use of plant extracts. pp. 347-364. In overview of sustainable agriculture. Rural Economy and Horticultural
- Okabe, K. 1988. Disease and pests of tea tree. pp.209-274. In new complete book of tea industry. Tea Association of Shizuoka Pref.