Survey, Recovery and Made Tea Quality of Wild Tea Tree on Yung-Kang Mountain in Taitung

Hun-Yuan Cheng　Horng-Jey Fan　Shin-Yan Chen　Huey-Tzang Chen

The present study was aimed to understand the wild tea tree status and distribution on the protection, biodiversity, ecology conservation and recovery, and utilization. The contexts include survey of distribution and morphology features of the wild tea tree of Yung-kang Mountain in Taitung. We have also studied study of germplasm resources collection, conservation, recovery and utilization. The experimental results are summarized in the following.

The wild tea tree of Yung-Kang mountain was distributed north latitude from 22 ° 55’40.3” to 45.8”, east longitude from 121 ° 05’49.3” to 56.2”, and altitude from 866 to 875 m. The distributed area, total target and plant number were 4.76 ha, 69 and 121, respectively. The results of phonological phases survey show that tea shoot burst phase and plucking phase are March and the first ten-day period of May respectively. No plucking tea trees had continued growing and formed shoots, and then burst buds in the next spring season. Flowering phase was from July to November and fruiting phase was from April to November. The leaf morphology was of large-leaved type, which include lanceolate and oblong. The CV value of the length of the upper part of leaf margin, expose, interpose and angle of lateral vein among wild tea tree were higher. The angle of lateral vein, number of serrations, and number of lateral vein was lower. The CV value of the 1st and 2nd internode length and leaf area was also higher. The internode diameter and leaf thickness was lower. The green and black tea was the best. The tea shoot chemical component of wild tea tree and TTES No.12 or Chin-Hsin Oolong was obviously different. Recovery of wild tea tree including the establishment of organic wild tea tree garden, experimental plot of wild and cultivated tea tree and wild tea tree ecology observation garden.

Key words：Wild tea tree, Biodiversity, Ecology, Conservation, Recovery

Study on the Genetic Diversity among the Selected Taiwan Tea Cultivars/lines Using AFLP and RAPD markers

Hsien-Tsung Tsai　I-Chen Tsai　Wen-Ru Liaw Ching-Kuang Chang Yue-Wen Wang

Thirty-six released cultivars and lines preserved in the Tea Research and Extension Station were used in the study of the genetic diversity of the Taiwan tea genetic resource. Two of the DNA molecular marker systems, namely AFLP and RAPD, were used in the study. More than four hundred of polymorphic bands from 8 primer combinations were identified in the AFLP analysis. Two hundred and three informative polymorphic bands were included in the analysis of the genetic diversity. The calculated genetic diversity among the samples ranges from 0.03 to 0.9.　The genetic relationship among the samples was further studied using UPGMA methodology in the cluster analysis. The result indicated that the 36 samples could be divided into two groups. There are 31 samples, including TTES No. 1 and Chin-Shin Oolong, in the first group and five samples are included in the second group, including TTES No. 7 and No. 18. Fourteen selected random primers were used in the RAPD analysis, which revealed more than 200 polymorphic bands. Fifty-six informative bands were included in the analysis of genetic diversity. The calculated genetic

diversity among the samples ranges from 0.04 to 0.85, which is approximated to the result of AFLP analysis. As in the AFLP analysis, the RAPD data was also used to study the genetic relationship among the samples using UPGMA methodology in the cluster analysis. Two groups were also identified from the analysis, which are approximated to the AFLP analysis as well. The cluster analysis using the two DNA marker systems was coincided with the grouping using agronomic traits. The pedigree among the samples was identified by the DNA marker, which also correlated with the recorded data. Another issue addressed in this study was the magnitude of the genetic diversity between the released cultivars and their parental lines. The comparison between the population of the parental lines and hybrids did not show any evidence of reduction of the genetic diversity.

Key words：AFLP, RAPD, Camellia sinensis, Genetic diversity

Effects of Water-soluble Diffusates on the Self-incompatibility of Tea

Meei-Ju Yang Iou-Zen Chen

In vitro studies of the self-incompatibility character were created. Pistils are dissected to 4 parts, that are stigma, style, ovary and ovule, and put on the culture medium, pollen from self and other cultivars are placed away from the pistil organ about 1~2mm. Self pollen germination and pollen tubes growth are repressed remarkably at the base of the style and ovary in the self-pollination treatment. In vivo observation of pollen tube growth in pistil by fluorescent microscope showed that pollen tube would grow towards the ovary, and cease at the place near the ovule. Only few of them can grow into ovules. However, the percentage of ovules, which have pollen tube grown in, is much higher than the percentage of fruit setting after self-pollination. So there must have other factors that affect the self-pollinated flowers to set fruit. Therefore, we suggest that the self-incompatibility in tea is late acting, and the rejection is taking place in the base of style, ovary, or inside ovule.

Key words：In vitro culture, Pollen tube growth, Water-soluble diffusates, Chemotropism

Effect of Temperature on Yield and Quality of Plucked New Shoot for Tea(Camellia sinensis (L.) O. Kuntze)

Shu-Mei Lee Iou-Zen Chen

This study aims to understand how temperature affects on yield, quality and chemical composition of plucked new shoot for tea. The results show that temperature significantly affects growth and development, the mineral nutrients content in tea buds, and the production of tea saplings. Also, the results show that the growing features are different among breeds, i.e. different adaptation upon changing the temperature. The responses were significantly different with temperature, and the optimum growth temperature for the two cultivars, TTES No. 12 and Chin-Shin Oolong were also different. The better root temperature for bush growth was close to the air temperature. ‘TTES No. 12’ and ‘Chin-Shin Oolong’ have more new shoots cultivar at 33/27℃+ 30℃ (air temperature + root temperature) and 23/17℃+ 20℃, respectively. As far as the production of tea

sapling is concerned, TTES No. 12 has higher production rate at 28/22℃+ 25℃, whereas it was 23/17℃+ 20℃ for 'Chin-Shin Oolong'. As for leaves bud characters, the best temperature condition of 'TTES No. 12' was at 23/17℃+ 20℃, and 23/17℃+ 15℃ for 'Chin-Shin Oolong'. The lower air temperature (23/17, 18/12℃) and slightly higher root temperature can significantly promote the nitrogen content of buds and leaves (one bud and two leaves). The total free amino acid content of both breeds is higher at 33/27℃+25℃ and 28/22+, 23/17+, and 18/12℃ + 30℃, respectively. The tendency shows opposite effect in the total free amino acid content, the caffeine, and the total polyphenols in the buds.

Key words：Tea, Temperature, Yield, Quality, Nutrient element, Chemical composition

Effect of the Drought on the Yield and Prevention Measures of Tea Tree in Hualien and Taitung Area

Hun-Yuan Cheng

This study was to investigate the effect of drought damage on the shoot yield of different cultivars, production, manufacture, drought effect factor, climatic change, prevention measures of the tea tree （Camellia sinensis（L.）O. Kuntze）from 1991 to 2002 in southeastern tea districts of Taiwan. The experimental field prevention measures treatment include（A） rice husk mulching and no irrigation, （B）rice husk incorporation and no irrigation, （C）weekly irrigation and no mulching, and（D） no mulching and no irrigation（CK）.

The Chin-Hsin Oolong was more severely affected due to drought in second summer tea season at Juisui tea district of Hualien Hsien. The climatic change of drought and no drought season was more obvious. The TTES No.17 and Shiang Yuan were higher drought tolerant. Conversely, the TTES No.5, Chin-Hsin Oolong and Shoei Shian were relatively lower drought tolerant. The rice husk mulching or incorporation of tea tree row could improve the soil environment constrain factor of drought damage, including soil hardness, water conservation, and decrease of soil temperature. Therefore, The prevention measures of drought damage were needed to the best culture and management of tea garden. For example: deep tillage, soil surface mulching of tea tree row, shading of tea tree canopy, less use of herbicide, reasonable application of chemical and organic fertilizer, summer shoot retention, and other prevention measures include attentive climatic changes of drought season, reinforce irrigation equipments, plant tolerant cultivars in tea field easier suffering from drought damage.

Key words：Tea tree, Drought, Rice husk

Study on Using the Rail Mechanical Plucking Management System in Hand Plucking Tea Area

Teng-Feng Huang　Chin-Liou Lee　Yeun-Kung Chang

In order to introduce the merits of labor saving and high operation accuracy of rail mechanical operation system to the farmers of hand plucking tea areas, we have compared rail mechanical plucking, two men mechanical plucking and hand plucking. The ratio of repeated cut tea shoots

were 1.5% and 3.0%, respectively, for rail mechanical plucking and two men mechanical plucking. This proved the high operation accuracy of rail mechanical plucking. The required plucking time for the same tea field area （4 rows x 30 meters）, rail mechanical plucking were 0.42 hrs, 0.2 hrs, and 1.57 hrs, respectively, for rail mechanical plucking with 1 operator, two men mechanical plucking and hand plucking of 16 pluckers. The plucking cost of 1 kg fresh tea shoots for rail mechanical plucking and two men mechanical were NT$ 1.3, but NT$ 40 for hand plucking. The comparison of plucking labor need, plucking time and plucking cost showed that either way of mechanical plucking was more efficient than hand plucking.
Better fresh tea shoots from rail mechanical plucking may result in better tea quality. Obviously this rail mechanical plucking method is better than two men mechanical plucking of tea.
Key words：Tea, Field management, Rail mechanical operation system

Effect of Green Lacewing, Mallada basalis (Walker) on the Control of Kanzawa Spider Mite, Tetranychus kanzawai Kishida in Tea Plantation

Suh-Neu Hsiao

The larvae of green lacewing, Mallada basalis (Walker) were released to control the kanzawa spider mite, Tetranychus kanzawai Kishida reared with soybean seedlings in the pot. Forty, 80 and 120 lacewing larvae were released every three days in each pot. The results showed that the green lacewing had the ability to inhibit the kanzawa spider mite. The more individuals of the green lacewing were released at the same time, the higher controlling effect was achieved. When the population density of the spider mite was lower, the control effect achieved was faster. We found that nine days old larvae of green lacewing inhibit the kanzawa spider mite faster than the others. Besides, the kanzawa spider mites were inoculated into tea trees in the field to compare the effect of different individuals of the larvae of green lacewing on the spider mite. The results showed that it was affected by the population density of the spider mite and the number of lacewing larvae released. The population density of the spider mite was inhibited faster by releasing 80 larvae than releasing 40 or 20 larvae of the green lacewing. While the densities of the mites were 20 individuals (including eggs and each developing stage) per leaf, the density of the mite was obviously declined after 80 larvae of the green lacewing were released per tea tree in one time. The control rates of mite and egg were 84.4% and 94.5%, respectively. While the densities of the mites were 42 individuals per leaf, it needed to release 80 larvae of the green lacewing per tea tree twice to decline the density of the mite. The control rates of mite and egg were 77.7% and 95.7%, respectively. The test was also conducted in natural occurring plantation. However, there was no difference between control and check area because of the predacious mites.
Key words：Soybean, Tea tree, kanzawa spider mite, Tetranychus kanzawai Kishida, Green lacewing, Mallada basalis (Walker)

Studies on the Residue of Organophosphate Insecticides in the Fresh Tea Leaves

Chia-Chang Wu

The samples of this study are 200 tea farmers who had been sampled randomly from the mailing list of the Quarterly Tea Industry Newsletter. The research method utilized mail questionnaires. The object of this study is to survey conditions of understanding for lifelong learning & their learning motivation, ways and contents of lifelong learning, conditions of application in tea manufacturing & marketing and its influence. We propose some suggestions for tea extension & counseling for governments.

The results show that all tea farmers agree the definition of lifelong learning defined by this study, 90% nearly farmers had attended many kinds of lifelong learning. The major lifelong learning, conducted or published by Tea Research & Extension Station (TRES) was trainings, demonstrations, seminars and extension brochures. The majority of them hold that they would attend lifelong learning successively. Nowadays, the lifelong learning, which tea farmers usually attended, is still the TRES's trainings, demonstrations, seminars and extension brochures. Tea farmers obtained this information from TRES. The major motivation of attending lifelong learning was learning of new knowledge or skills. They do like or want to attend the lifelong learning via trainings, demonstrations, or seminars which are conducted by TRES and tea culture activities, respectively. The major factor that can affect tea farmers' learning is the conflict of management time. But almost 90% tea farmers will consider attending lifelong learning after the improvement of the above factor. The majority of tea farmers hold that attending tea lifelong learning will benefit to manufacturing and marketing. That is, customers approved their manufacturing skills. Besides, most of the tea farmers hold that governments should increase curricula, places, time and propaganda of tea lifelong learning.

Key words：Organophosphate, Pesticide residue, Tea

Studies on the Motivation of Lifelong Learning of Tea Farmers & Its Application

Cheng-Nan Lai Shang-Shiun Yung

The samples of this study are 200 tea farmers who had been sampled randomly from the mailing list of the Quarterly Tea Industry Newsletter. The research method utilized mail questionnaires. The object of this study is to survey conditions of understanding for lifelong learning & their learning motivation, ways and contents of lifelong learning, conditions of application in tea manufacturing & marketing and its influence. We propose some suggestions for tea extension & counseling for governments.

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Key words：Tea farmer, Tea industry, Lifelong learning, Learning motivation

Case Study of Enterprises Management Improvement for the Fifth Team of Tea Production and Marketing Groups in Pinglin Township, Taipei County

Jin-Chih Lin Wen-Ru Liaw

The fifth team of tea production and marketing in Pinglin Township consisted of farmers with the same goal. Members in the team work together in harmonic cooperation. It is expected to enhance efficiency under the introduction of business management from advisory experts of the Tea Research and Extension Station.

The goal of this study includes improvements for tea garden cultivation and manufacture techniques, promotion of tea management efficiency, establishment of tea evaluation and grading system, reconstruction of brand image, enhancement of income for members, and ensuring the income for consumers. The team will promote "tea in life" activity, to make people enjoy and recognize the culture of tea.

Besides, this study aims on combination of the production, living, and ecology for native agriculture, and extend it to tea manufacture practice camp for the tourists. The whole vision is to improve and promote the efficiency of the management of tea production and marketing.

Key words：Tea, Agricultural production and marketing groups, Farming commercialization

Study on the Quality and Bulk Density of Different Grade Tea Samples Used in Famous Tea Contest

Kuo-Renn Chen Jin-Chih Lin

This study is to investigate the relationship between the qualities of different grades and bulk densities of tea samples used in the famous tea contest.

The difference of aroma is remarkable among the grades. The liquor color and appearance have differences between in-grade and out-grade teas. The bulk densities of high-mountain tea, Tungding Oolong tea and Mingjian Oolong tea are 435g/l, 430g/l and 428g/l, respectively, which are the heaviest Taiwan specific teas. The bulk density of semi-ball type Paochong tea from Mucha and Taitung tea area are 375g/l and 370g/l, which are the middle ones. The bulk densities of Wenshan

Paochong tea and Formosa Oolong tea are 185g/l and 162g/l, which are the lightest. Different shapes from different degrees of ball rolling affect these results above.
In the statistical analysis of tea grades and bulk density, there are no differences between the grades and densities of Wenshan Paochong tea, Formosa Oolong tea, Longtan tub-ball type Paochong tea and Mucha Teh-Kuang-Yin tea, but there are differences between in-grade and out-grade teas of Taitung , Luku and Chia-I tea areas. Comparing the times of ball rolling and tea bulk density reveals that the bulk density of 1st, 2nd and 3rd ball rolling times are 180g/l, 230g/l, 300g/l, respectively, and the average of 5th to 7th ball rolling times is 430g/l. To meet the demand of unique shape and to lower the cost, ball rolling is suggested for 5 times.
Key words：Bulk density, Ball rolling, Famous tea contest, Tea tasting, Grade

Study on Tea Farmers of Pinglin and Shihding Townships：Their Attitudes about the "Famous Tea Contest"

Jyh-Shyan Tsay Chwei-Feng Chiou Kuan-Li Kuo You-Zenn Tsai

Wenshan Paochung tea is classified as a lightly fermented tea in the semi-fermented tea category, which is mainly produced in Taipei county. The plantation area is about 2,300 hectares, in which the Pinglin township accounted 1,000 hectares (the largest) and Shihding township accounted 500 hectares (the second). The tea farmers and tea traders offer tea produced at that season to the sponsor of "Famous Tea Contest". The professional tea tasters invited by the sponsor assess and grade the quality of the tea. Those tea are packaged and sealed according to its grade and then sent back to the contestant. The awarded tea will be displayed and sold publicly; this is a way of promotion in tea marketing. During the spring tea season in 2001(Pinglin) and 2002(Shihding), we surveyed the contestants' opinion by questionnaires; we hope the result could be a base for improving tea production and marketing in the future. 169 questionnaires were taken in Pinglin, and 166 (90.2%) of them were valid, 3(1.8%) were invalid. In Shihding, we took 87 questionnaires, 85(97.7%) of them were valid and 2(2.3%) of them were invalid. In Shihding, 96.4% of the contestants in Pinglin and 87% of the contestants in Shihding held positive opinion that holding "Famous Tea Contest" can assure the quality of the tea and stabilize the tea price in the market. 94% of the contestants in Pinglin and 87% in Shihding thought that the contest could increase non-contested tea selling, and it is also an important way of promotion. 73.5% of the contestants in Pinglin and 90% in Shihding think that the grading of tea performed by the tea tasters of the "Famous Tea Contest" is fair. But 65.7% of the contestants in Pinglin and 56.5% in Shihding don't approve that the teas of the same grade blended and packaged altogether after contest. Only 29.5% of the contestants in Pinglin and 39.5% in Shihding approve it.
Key words：Famous tea contest, Wunshan Paochung tea, Production and marketing, Pinglin township, Shihding township

A New Record of Blepharipa zebina Walker, 1849 (Diptera : Tachinidae), a Parasitoid of Andraca bipunctata Walker in Taiwan

Hisn-Kuang Tseng、Shu-Pei Chen、Cheng-Yu Wong

The Blepharipa zebina Walker, 1849 was found in Taiwan recently. Some comments on morphological characteristics, geographical distribution and hosts of the insect were described.

Key words：Blepharipa zebina Walker, Diptera, Tachinidae, New record, Taiwan