

Chemicals Screening and Control of Horse Hair Blight (*Marasmius equicrinis*) of Tea Plants

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Summary

Horse hair blight (HHB) occurs sporadically in tea plantations throughout Taiwan, including Pinglin in New Taipei city, Dongshan in Yilan county, Mingjian and Zhushan in Nantou county, Linnei in Yunlin county, Namasia in Kaohsiung city, Luye in Taitung county and other tea areas. The growth of tea plants will not be significantly affected in the early stage of the disease occurring. Tea plants with HHB long term infection for years become low density of bud leaves, small leaves, slow growth of plants, reduced yield and weakened trees. However, there are no approved registration fungicides to control this disease. In this study, we evaluated the efficacy of 11 fungicides included Tetraconazole, Tebuconazole, Difenoconazole, Iminoctadine triacetate, Benomyl, Thiophanate-Methyl, Pyraclostrobin, Fluazinam, Dithianon, Kasugamycin hydrochloride + Carbendazim, and Pyraclostrobin + Dithianon to control HHB. The data showed 8 fungicides inhibited the HHB mycelia growth effectively in low active ingredient concentration. In the evaluation of fungicide to control HHB rhizomorph test, only Tebuconazole showed 50 %inhibition rate of the rhizomorph growth under active ingredient concentration 100 ppm. It was also showing the same result with the field trail. In addition to the application of chemical fungicides to control HHB, to integrate multiple control strategies such as avoiding the introduction of rhizomorph from other tea plantations, strengthening the tea plants fertilizer management, and thoroughly cleaning up pest source could reduce the HHB pathogen population and maintain the tea plant growth.

Key words: Rhizomorph, Tebuconazole, Clean up source, Integrated pest management

Test Report for TTES No.24-New Tea Cultivar Officially Names in 2019

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Summary

TTES No.24 is the first pure Taiwan native wild tea descent among all Taiwanese tea cultivars. It was introduced to the breeding field in 2000. From then till 2015, five potential lines had been chosen. Again, more comparisons had been done afterward until *Camellia formosensis* var. *Yunkangensis* No.1 was finally selected from them in 2018. Then it officially named “TTES No.24” on June 20, 2019. Its bud was reddish-prone, no pubescence and its leaf shape was lanceolate. In addition, with strong and rapid growth rate, great resistance to diseases and pests, and high bud density, the annual yield of leaves per hectare of TTES No.24 could be up to 10,000 kilograms. It was suitable to be manufactured green tea and black tea. The made tea had a unique post-brew scent possesses a blend of mushroom, almond,

and coffee. Further, the flavor of infused tea was rich, slight astringent and less caffeine than TTES No.18.

Key words: Tea, Breeding, Yield, Cultivar, Caffeine

Evaluation of Shoot Growth and Quality of Yung-Kang Wild Tea Cultivated in Taitung Lowland

Hun-Yuan Cheng

Chin-An Yu

Summary

The purpose of this study was to investigate the effects of Yung-Kang wild tea on the shoot growth characteristics and tea quality, and to evaluate its adaptability to the environment. It can provide reference for breeding resources, economic cultivation and development of new flavor teas. Experimental wild species and cultivars were including Yung-Kang wild tea, Nan-Fong wild tea, Dah-Yeh Oolong, Chin-Shin Oolong, TTES No.8, TTES No.12, TTES No.18, TTES No.19 and TTES No.20. According to the experimental results, Different year and tea seasons, due to differences in climate, affect the growth of tea shoot, and reach significant differences. The shoot growth of Yung-Kang wild tea was still better, especially in spring and winter tea. It has good adaptability in lowland cultivation, and it was significant different from cultivated tea tree. The growth period of tea tree has little effect on tea bud and leaf characteristics. The quality flavor of green tea made by Yung-Kang wild tea was honey yellow-green and bright liquor color, possessed green mushroom vegetables aroma and taste, and slightly bitter & sweet aftertaste. Made of black tea, the liquor color was bright red, the aroma was green mushroom and sweet, the fruit flavor was rich, the taste was sweet and astringent. The quality characteristics of Yung-Kang wild tea were different from those of large and small leaf cultivars, and each time the tea was produced, it could stably present a special flavor, which was a germplasm resource suitable for manufacturing black tea and green tea.

Key words: Yung-Kang wild tea, Growth, Quality

Evaluation of Plant Growth and Yield of Yung-Kang Wild Tea Cultivated in Taitung Lowland

Hun-Yuan Cheng

Chin-An Yu

Summary

The purpose of this study was to investigate the effects of Yung-Kang wild tea on the plant growth characteristics and shoot yield, and to evaluate its adaptability to the environment. It can provide reference for breeding resources, economic cultivation and development of new flavor teas. Experimental wild species and cultivars were including Yung Kang wild tea, Nan Fong wild tea,

Dah-Yeh Oolong, Chin-Shin Oolong, TTES No.8, TTES No.12, TTES No.18, TTES No.19 and TTES No.20. According to the experimental results, different years and tea seasons, due to differences in climate, affect the plant growth and yield of tea tree, and reach significant differences. Yung-Kang wild tea has strong growth vigor and canopy wide plant characteristics. The shoot density was higher than that of large and small leaf type cultivars. Its germinate characteristics belong to the bud number type, which can still germinate during the low temperature period in winter, and was higher than summer and autumn tea seasons. The 100-shoot weight was lower than the large leaf type cultivar TTES No.8, similar to TTES No.18, and has high and low levels with small leaf type cultivars, high yield and stability, and can maintain high yield in the environment of climate adversity. It has good environmental adaptability in lowland cultivation and can be used as a germplasm for screening of stress-resistant cultivars.

Key words: Yung-Kang wild tea, Growth, Yield

Effect of Shading on the Growth and Quality of Tea Trees in Summer and Autumn Tea Seasons

Hun-Yuan Cheng

Summary

The purpose of this experiment was to investigate the growth of different tea cultivars in the shading environment and the effect on the quality of tea, so as to understand the shading adaptability of different tea cultivars, as a reference for the application of shading facilities in tea gardens. The experimental treatments included (A) shading facilities (70%), (B) shading facilities (50%), and (C) Control plot (no shading CK). According to the experimental results, the tea garden was equipped with an elevated horizontal black shade networks. The temperature decreases with the increase of the shading, the relative humidity increases, and the effect of reducing the luminosity were achieved. Especially in the case of high temperature and foehn happen, the temperature in the no shading facilities was significant higher than that in the shading facilities. When the relative humidity was lower, the humidification phenomenon in the shading facilities was particularly obvious. Shading could promote the expansion of the canopy of tea trees. The leaf number, shoot length, plucking shoot length, internode diameter, internode length, leaf length, width and area were larger than that of no shading facilities, and the leaf thickness was shows opposite changes. The shoot density of the shading facilities was lower, the weight of the bud was higher, and the water content of the tea bud was slightly larger or closer to the no shading facilities. Yields can increase in shading facilities in June White and autumn tea season. Yong-Kung wild tea has higher yield in shading facilities, Day-Yeh oolong with 50% shading was higher yield, Chin-Shin Oolong and TTES No. 12 were roughly higher yields in shading facilities, yield of summer tea season and White Dew in shading facilities was similar or lower than the no shading facilities, but did not show significant differences. Four cultivars of the honey-flavor green tea made from the shading facilities, the quality was better. The shading effect of autumn tea season was greater than the summer tea season.

Key words: Tea tree, Shading, Microclimate, Growth, Quality

Study on the Growth and Quality of Cutting-Graft Tea Tree

Hun-Yuan Cheng

Summary

The purpose of this experiment was to investigate the effects of cutting-graft tea tree plantation on field growth, yield and quality changes, as well as investigate the injury of tea trees during natural disasters, and improve the tolerance of Chin-Shin Oolong to climate adversity by cutting-graft techniques. Continue to preserve the excellent characteristics of the cultivar as a reference for promotion and application. The experimental treatments included (A) Cutting-graft Oolong (Scion: Chin-Shin Oolong, Rootstock: TTES No.12), (B) Chin-Shin Oolong, and (C) TTES No.12. The results of the experiment showed that the plant traits, shoot characteristics, yield and quality of the cutting-graft tea trees were similar to those of the scion cultivar Chin-Shin Oolong, and they were stable and persistent. The cutting-graft technique could maintain the characteristics of the Chin-Shin Oolong cultivar and the quality of the tea. Although the survival rate of cutting-graft tea trees was higher, the results of meteorological disaster investigations show that in the low-altitude tea plantation of Taitung, the combination of Chin-Shin Oolong and TTES No. 12 cutting-graft was still unable to overcome the high temperature and drought climate adversity.

Key words: Tea tree, Cutting-graft, Growth, Quality

The Differences in Photosynthetic Characteristics among Different Cultivars of Tea (*Camellia sinensis* (L.) O. Kuntze) under Conditions of Fixed Leaf Temperature

Chung-Wei Chen

Summary

There were not only differences in phenotypic traits but also photosynthetic characteristics among different cultivars of Tea (*Camellia sinensis* (L.) O. Kuntze). To investigate the characteristics between cultivars, eight cultivars of Bair Yeh, Chin-Shin Oolong, TTES No.8, TTES No.12, TTES No.18, TTES No.21, TTES No.22, and TTES No.23 were chosen for measurements of photosynthetic rates under conditions of fixed leaf temperature 30°C. The results showed that the photosynthetic rates and the energy distributions of absorbed light could differ among the tested eight cultivars. Chin-Shin Oolong, TTES No.12, Bair Yeh, and TTES No.22 had a larger proportion of the light energy used in the biochemical reaction other than Calvin cycle. The other four cultivars still exhausted light energy to assimilate CO₂. TTES No.8 showed higher stomatal conductance, and it also showed that the unique equilibrium between transpirations and CO₂ assimilation rates were different from that of other cultivars. The influence of cultivation environment on photosynthesis is related to the survival of plants.

This experiment measured the photosynthetic parameters on the boundary between moderate and high temperature, and the results could be applied to select the breeds that could be potentially tolerant to heat stress.

Key words: Photosynthesis, Light reaction, Calvin cycle

Effect of Different Scenting Conditions on the Quality of Osmanthus Scented Tea

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Summary

Scenting green tea with 5% water content to produce scented-tea should need 12-16hours, but scenting green tea with 10-20% water content or scenting by vacuum 8 hours could have similar aroma effect. Water content of tea will increase after scenting, they should proceed drying to decrease the water content below 5% to ensure the quality. The results show that the water content becomes 5% and electricity is 1.13 kWh after drying with 80°C and 30 minutes. But it could reach safe standard after drying with 60°C and 60 minutes. Therefore, use wet-scenting teas or vacuum scenting for 8 hours, and dry with 80°C might be a time-saving and labor-saving process. Furthermore, scenting by vacuum and wet-scenting teas could let aroma becomes more fragrant and without any bynote. Scenting by different fragrant flowers with teas in specific conditions could produce flavored teas with complex flavor types, provide more multiple tea products for consumers to choose, and promote competitiveness for scented tea markets.

Key words: Tea, Scent tea, Save time and labor

Investigation of Correlation between the Ranking of Bi-Luo-Chun Contest Tea in Sanxia and the Components in Tea Liquor

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Summary

Bi-Luo-Chun is a unique green tea in Sanxia District, New Taipei City. The contests are held in spring and winter every year. The ranking of contest tea are evaluated by the appearance, liquor color, aroma and taste and infused tea leaves. There are six categories of contest teas, including special award, first prize, golden award, silver award, merit award and the eliminated teas. The aroma and taste of sensory evaluation are closely related to the components of the tea. Therefore, we collected 25 tea samples of the different grades from the spring tea contest in 2019. We analyzed the chemical components and the volatile organic compounds. The results show that total reducing sugars and specific volatile organic compounds could be used as the basis for estimating the five grades. If we

only classified the tea sample into two grades which are shortlisted and eliminated. Then the total polyphenols, total free amino acids, total reducing sugars, gallic acid, caffeine and catechins could be used as the basis for judgment.

Key words: Sensory evaluation, Quality, Green tea

Deconstructing Tea Composition Characteristics by Liquid Chromatography Mass Spectrometry and Discussing Its Correlation with Fermentation Reaction

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Summary

Forty-six compounds were characterized for three different fermentation-degree teas (green tea, paochung tea and black tea) by analytical liquid chromatograph tandem mass spectrometer with collision-induced dissociation (CID). It showed that variation of compositions after tea fermentation. Catechins and flavonol aglycones were significantly decreased followed by formation of organic acids, theasinensins and theaflavins. In addition, a lot amount of catechin dimers were detected in green tea, and decreasing when proceed further fermentation. The technology can be further applied to the establishment of quality control technology and processing process reference indicators in the future.

Key words: TTES No.17, Liquid chromatography mass spectrometry (LC-MS/MS), Collision-induced dissociation (CID), Fermentation, Catechin dimers, Theasinensins, Theaflavins, Flavonols, Organic acid

Research and Development of Tea - Plastic Recycled Composite

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Summary

Natural fiber reinforced polymer composites gained a significant interest during the last decades, due to the advantages (ready availability, lower cost, recycled feasibility and environmental friendliness) in relation to use of the natural organic fiber rather than an inorganic mineral one. However, most of these researches have been performed on composites based on wood flours, rice-hull flours or wheat/crop straw flours, etc. In this study, tea flours (TF) / recycled high degree polyethylene (rHDPE) composites were prepared. The different ratio of tea flours / rHDPE (TP37: 30/70, TP46: 40/60, TP55: 50/50 and TP64: 60/40) were compounded and extruded through extrusion process. The physical and mechanical properties of the TF / rHDPE composites were investigated. Experimental results revealed that increasing TF content in composites improved the bending and tensile modulus

(stiffness), but resulted in less favorable moisture content, thickness swelling, water absorption, bending and tensile strength. After dynamic mechanical analysis testing, the bending properties showed an increase of rigidity of the composites upon increasing the TF content. Concerning the properties and application, the mixture of 50 wt% TF and 50 wt% rHDPE provide a reasonable balance to the extruded composites.

Key words: Wood, Plastic, Recycled composite, Tea flour

The Research of the Thermal Efficiency of the Hybrid Dryer

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Summary

The hybrid dryer was designed in the research to save the electric energy, which fire the gas to be the major heat and control the temperature by the electric energy. We compare with the electric and the gas consumption of the electric dryer and the hybrid dryer. The temperature of the dryer is 90°C and worked 3 hours. Record the temperature of the 24 position in the dryer 3 times. The results show that the electric power consumption of the electric dryer is 6.67 kWh, the rise time (T_r) is 18 min, and the settling time (T_s) is 30 min. The electric power consumption of the hybrid dryer is 3.729 kWh, the gas power consumption is 0.533 kg, the rise time (T_r) is 13 min, and the settling time (T_s) is 18 min. The hybrid dryer's performance of warming up and stability is better than those of electric dryer. By the electric power consumption analysis, the hybrid dryer can save 44% electric power consumption. By the cost-effectiveness analysis, the hybrid dryer may save 0.6 NT dollars (electricity bill and the gas bill for working three hours). In Taiwan, the electric power consumption is increasing, but the power plants are not constructed in recent years. In the future, the energy shortage crisis will happen, hybrid dryer might save the electric power consumption and solve the energy shortage crisis for tea farmers.

Key words: Hybrid dryer, Dryer, Thermal efficiency

The Study of Curriculum Planning and Integration of Tea: the Case of the Intermediate Class of Tea Sensory Evaluation in the Farmers' Academy

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Summary

This study investigates the current knowledge, technical ability, working requirement of tea industry operated by students who participated in the intermediate class of tea sensory evaluation in 2017. The questionnaire is designed about total of 15 items and 4 constructs which about tea tree cultivation, tea manufacturing technology, tea sensory evaluation knowledge and skills. According to

statistical analysis, after training the abilities are actually increased, and students' backgrounds (ex., gender, age, farming area and mode) possess significant relationship for ability, working requirement and learning difficulty, and the results could be references for courses planning. The results show that the relevance in working importance and level of ability enhanced after training through importance-performance analysis (IPA), they could provide references for reviewing and planning of future training courses, and provide key reference points for tea sensory evaluation tasters' training.

Key words: Evaluation of training effectiveness, Tea sensory evaluation, The Farmers' Academy