

Establishing a Prediction Model of Tea Harvest Date

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Summary

This research has aimed at four cultivars - Chin-shin Oolong, TTES No.12, TTES No.19 and TTES No.20 which are suitable for processing Paochung teas in northern tea district and has conducted continuous four-year research from pruning to harvest. The coefficient of variation was used as a measure of variability to determine the base temperature through statistical regression method to calculate the base temperature with the least variance. Base on four years experiment data, from pruning to harvest, in spring-season tea, the average growth days, the temperature summation (summation of daily average temperature), the base temperature and the heat unit summations of four cultivars are as following: Chin-shin Oolong (69.1 days, 1,115.8°C, 1.8°C and 989.1°C), TTES No.12 (66.7 days, 1,071.5°C, 2.2°C and 924.5°C), TTES No.19 (71.1 days, 1,157.8°C, 1.7°C and 1,034.0°C) and TTES No.20 (63.1 days, 1,000.5°C, 1.3°C and 923.2°C), respectively. Base on four years experiment data, from pruning to harvest, in winter-season tea, the average growth days, the temperature summation (summation of daily average temperature), the base temperature and the heat unit summations of four cultivars are as following: Chin-shin Oolong (56.7 days, 1,223.4°C, 4.5°C and 976.2°C), TTES No.12 (54.3 days, 1,184.6°C, 5.1°C and 910.6°C), TTES No.19 (56.1 days, 1,220.9°C, 4.5°C and 966.8°C) and TTES No.20 (48.5 days, 1,070.9°C, 4.5°C and 852.4°C), respectively. Using above data and meteorological information in those seasons, it would help predict effectively the suitable plucking period for important cultivars in northern tea district.

Key words: Temperature summation, Base temperature, Prediction of plucking date

Study of Quality Characteristics, Chemical Component and Mineral Element Content of Yung-Kang Wild Teas

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Summary

The experimental material in this study was collected from Yung-Kang wild tea trees by Taitung Branch, Tea Research and Extension Station, for quality characteristics, chemical component and mineral element content analysis. The study is aimed to understand the characteristics of the flavor quality of Yung-Kang wild tea, and the differences between wild species and cultivars can be a reference for the development and utilization of Yung-Kang wild teas. The qualities of green tea and black tea quality were better than those of Pouchong tea of Yung-Kang wild tea leaves. The quality characteristic was a flavor of obvious raw fresh mushroom. The green tea made of old leaves still has a drinking value. After several brew, the tea has durable quality. Durative brewing characteristic of black tea was higher than green tea. Chemical component of fresh young or old leaves and its made tea had not appear extreme high or low values. Major and micro mineral elements content was abundant, mostly in the appropriate range. There are something different contents of heavy metal elements between Yung-Kang wild tea trees and other cultivars.

Key words: Yung-Kang wild tea tree, Quality characteristics, Chemical component, Mineral element

Study of Different Leaf Shape on the Shoot Characteristic, Chemical Component and Manufacture Quality in Yung-Kang Wild Tea Leaves

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Summary

The experimental material in this study was collected from Yung-Kang wild tea tree by Taitung Branch, Tea Research and Extension Station. The study aimed at shoot characteristic, leaf color, tea quality, chemical component and mineral elements content analysis of different leaf shape. Integrate these characteristics as a reference base for breeding selection, utilization and development. The experimental results show that most of the shoot characteristic had significant differences in lanceolate and oval-shaped of Yung-Kang wild tea leaves. The 100-shoot weight and leaf greenness value of lanceolate leaf was significantly larger than oval-shaped leaf. Shoot characteristic of red and green bud lanceolate leaves have little differences. The chlorophyll content of green and Pouchong tea for green bud lanceolate leaf was higher than red bud lanceolate and oval-shaped leaves. Black tea doesn't have significant differences among leaf shapes. Oval-shaped and green bud lanceolate leaves were suitable for manufacturing Pouchong tea. Red and green bud lanceolate was suitable for manufacturing black tea. Regardless of the leaf shape, every type of shape was all suitable for manufacturing green tea. The chemical component difference of Pouchong tea was larger than that green and black tea among leaf shape. Most of the mineral elements were still in the appropriate range and haven't appeared extreme values.

Key words: Yung-Kang wild tea tree, Leaf shape, Chemical component, Tea manufacture Quality

Comparison of Wild Species and Cultivars on the Chemical Component and Mineral Element Content of Tea Trees

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Summary

The experimental study aimed at understanding differences of the chemical component and mineral element content in wild species and cultivars, which is as a reference utilization and development of new products and based on the selection and breeding. Differences of the chemical component was more obvious between wild species and large-leaf varieties, but also achieve significant differences, among which the single plant was more obvious than that of group wild species, and close to comparing with the caffeine, soluble sugar and amino acid content of small-leaf Cultivar. Soluble solids, polyphenols, catechins, caffeine content of fresh leaves and tea in Yung-Kang wild tea was significantly lower than that of large-leaf Cultivar, soluble sugar content of made tea was significantly higher than that large-leaf Cultivar. Most content of amino acid of Yung-Kang wild tea single plant is between large-leaf varieties. Nitrogen, potassium, calcium, magnesium, iron, copper, zinc content of green tea and fresh leaves was not obviously different between wild species and cultivars, mutual level. Phosphorus and manganese contents were more obviously different. Most content of minerals of Yung-Kang wild tea single plant is between large-leaf varieties.

Key words: Wild species, Yung-Kang wild tea tree, Chemical component, Mineral element

Introduction of a Bio-control Agent (*Beauveria bassiana*) Accompany with the Endophytic Ability

Shiou-Ruei Lin

Summary

Endophytes are microorganisms living in the internal tissues of the plants without causing symptoms. By definition, an endophytic fungus lives in mycelia form in biological association with living plants. The definition includes virtually the entire spectrum of symbiotic interactions in which fungi and plants participate: parasitism, commensalism and mutualism. Some endophytes, such as *Trichoderma*, *Beauveria*, *Streptomyces*, have been applied in greenhouse and field trials as biocontrol agents. *Beauveria bassiana*, a member of the ascomycetous family Clavicipitaceae, is known as an entomopathogenic fungus with worldwide distribution. This family of fungi is found in diverse ecological habitats and also well-known for production of secondary metabolites with toxic property. This study aimed at evaluating the endophytic ability of *B. bassiana* for applying to against plant pests and discussing the affinity between *B. bassiana* and woody plants. It expects to apply on the tea, oil-tea and coffee plants in advance to decrease the pesticides application during pest management in the field. Seven *B. bassiana* isolates, ITCC 6063, ITCC 4512, ITCC 4563, ITCC 5562, ITCC 4796, ITCC 5408, and ITCC 4705, were introduced through seed inoculation with spore suspension as an endophyte in white jute. The colonization frequency varied among the strains. Endophytic colonization of *B. bassiana* reduced stem weevil infestation under pot culture. *B. bassiana* isolates which isolated from insects, ATO01, ATO05, EABb04/01-TP and ATCC74040, showed the potential to protect cucurbits and grapevines against Zucchini yellow mosaic virus (ZYMV) and downy mildew caused by *Plasmopara viticola*, respectively. The influence factors of endophytic fungi colonization include growth rate of isolates, endophytic abilities of each fungal strain, compatibility with different host plant species or cultivars and inoculation methods. The mechanisms include direct modes, such as secondary metabolites (antibiosis), competition for space and nutrients and mycoparasitism, and indirect modes which are induced plant resistance and increased plant growth. The mode of action could be single or multiple occur in one endophytic fungus in host plant. It might differ with the control targets.

Key words: Entomopathogenic fungi, Endophytic fungi, Induced systemic resistance, Woody plants

Risk Assessment of Pesticide Residues in Second Winter Teas

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Summary

To establish the completely pesticide residue analysis method of 2nd winter tea for the complete security evaluation, the suitable sample preparation, instrumentation and the examination method is necessary. We had evaluated five sample preparation methods for pesticide residue analysis of 2nd winter tea. It suggested that the modified CNS13570-2 is the best sample preparation methods for pesticide residue analysis of 2nd winter tea. According to multipesticides residues analysis, it indicated that Chlorfenapyr, Imidacloprid, Cyhalothrin and Chlorpyrifos were the most use pesticides in Mingjian and Chushang tea areas. However, all the calculation results of exposure level are lower than the maximum permissible intake (MPI), it suggested that there should be no harmful effect to human health when consumers buy teas which fit the standard of maximum residue limits.

Key words: Tea, Pesticide residues, Food safety

Fungicide Selection on Controlling Coffee Rust and Residues Evaluation

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Summary

Coffee rust is one worldwide important coffee disease. As the coffee drinking habit of compatriot raises in Taiwan, the coffee plantations are gradually increasing. Therefore, there is the fungicide demand of controlling coffee rust in plantation. However, there is no permitted fungicide on controlling coffee rust in Taiwan so far. In this study, 22 fungicides which registered on other crops for rust diseases control were tested the ability of inhibiting the coffee rust spore germination. All of the testing fungicides showed the ability of inhibiting the spore germination with EC_{80} values $< 100 \mu\text{g/mL}$. It chose two different mode mechanisms fungicides, hexaconazole and chlorothalonil, for field trail. Hexaconazole 5 SC 1,500 folds diluted showed the efficacy of controlling coffee rust propagation and infection in plantation by spreading twice at the beginning of the disease occurring. It tested the two fungicides residual of coffee beans which washed and medium roasted after 60 days spraying. The data showed there is no detection of these two fungicides.

Key words: Spore germination, Hexaconazole, Field trail

Effects of Extraction Temperature and Time on the Contents of Tea Catechins and Total Polyphenols

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Summary

The extraction efficiency of tea components was usually influenced by solvent type, temperature, time, ratio of material to solvent and sample particle size. In order to enhance extraction efficiency, the purpose of this study was to discuss the effect of extraction temperature (70-100°C) and extraction time (10-60min) on the contents of tea catechins and total polyphenols when used pure water as extraction solvent, one step extraction and extraction ratio was 1:100 (w:v) for establishing the best extraction conditions of tea catechins and total polyphenols. The results showed that for the extraction of EGC, EC, EGCG and ECG, the best extraction condition was extracted in 70 ~ 80°C water bath for 10 min. For the extraction of tea total polyphenols, the best extraction condition was extracted in 100°C water bath for 60 min.

Key words: Extraction, Catechins, Total Polyphenols

Study on the Difference between Pu-erh Teas and Taiwan Unique Teas from Catechins Content and Tea Liquor Color

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Summary

The result showed that the main catechins in Taiwan Green tea, Wenshen Paochong tea, semi-ball type Paochong tea were ECG and EGCG while sun-dried green tea and Pu-erh raw tea were C, ECG and EGCG. C and EC content of sun-dried green tea and Pu-erh raw tea were higher than Taiwan unique teas. The a value of tea liquor color of Pu-erh ripe tea was highest and significantly different from other teas. The a value of Oriental Beauty tea and black tea were significantly different from sun-dried green tea and Pu-erh raw tea. According to the result in this experiment, the relative content of C and EC + C should be the auxiliary factor to distinguish Pu-erh raw tea from Taiwan non-fermented, light fermented and medium fermented teas. The tea liquor color should be the auxiliary factor to distinguish Pu-erh ripe tea from Oriental Beauty tea and black tea.

Key words: Taiwan unique tea, Pu-erh tea, Catechins

Research of the Improvement for the Small Type Electrical Panning Machine

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Summary

The temperature distribution is not uniform in the traditional panning machine, because the combustion is not uniform in the fireboxes. We designed and improved the small type electrical panning machine to solve the problem of temperature distribution. We measure the temperature of the machine wall and air of inner space. The results show that the average temperature of the machine wall of the gas panning machine is 259 ± 28 °C, and the average temperature of the machine wall of the electrical panning machine is 256 ± 10 °C. The average temperature of the air in inner space of the gas panning machine is 185 ± 10 °C, and the average temperature of the air in inner space of the electrical panning machine is 244 ± 3 °C. The sensory evaluation results show that tea aroma become more clear and taste become more fresh after electrical panning machine treatments. Electrical panning machine can make the temperature distribution uniform of the machine wall and air of inner space. In the future, we will design the big type electrical panning machine for the mass production.

Key words: Panning machine, Tea quality, Tea processing technology

The Evaluation of Probability for Machine-plucked Spring Teas in High Altitude Area

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Summary

The problems that hand-plucked spring tea in south-central Taiwan high altitude area encountered were concentrated harvest periods as well as the lack of labor, which interfered with the best harvest time for spring tea. Therefore, the experiment compared the effects of hand-plucked and machine-plucked on plucking and processing of spring teas in order to evaluate the probability for high altitude area to carry out machine-plucked during spring tea season. The experiment was conducted in a tea fields at Taiping Village, Meishan Township, Chiayi County which was 1,200 meters high. Survey items included yields per unit area, agronomic characteristics of flush, tea quality, chemical compositions, and nutritional element contents and cost analysis.

The results showed that the machine-plucked Taiwan Tea Experiment Station Number 12 (TTES No. 12) tea leaves had significant difference in yields per unit area, the sensory evaluation score, the amounts of theanine, caffeine and total catechin, and nitrogen contents compared to hand-plucked ones. As for cost analysis, machine-plucked tea leaves made into primarily processed tea cost NT\$ 505 per kg, and the hand-plucked one was NT\$ 1,039, which was almost the twice expense of the machine-plucked one. Overall, the gross profit of machine-plucked primarily processed tea was NT\$ 107,610 per 0.1 hectares, while hand-plucked one was NT\$ 78,082 per 0.1 hectares, the gross profit of the former was NT\$ 29,528 higher than the later.

In comparison to TTES No. 12, Ching Shing Oolong showed no significant difference between machine-plucked and hand-plucked teas, except for that the nitrogen, potassium, and aluminum contents was higher and other elements as phosphorus, calcium, magnesium, ferrous contents had an increasing trend in machine-plucked tea leaves. The cost of machine-plucked primarily processed tea was NT\$ 654 and hand-plucked one was NT\$ 824. However, the amounts of primarily processed tea were lower in machine-plucked teas after stalk separating. The gross profits of machine-plucked tea and hand-plucked tea were NT\$ 75,500 and 79,836 per 0.1 hectares, the gross profit of the later was NT\$ 4,336 higher than the former. In conclusion, spring tea in high altitude area could replace hand-plucked with machine-plucked method in response to the problem of plucking labor shortage.

Key words: Tea, High altitude area, Machine-plucked

The Study of the Management Competence and Success Factor for Young Farmers in Taiwan Tea Industry

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Summary

The research objective is to understand what young tea farmers have encountered what kinds of troubles and how to overcome them, and their critical success factors and future management goal. Then utilize these results to use as reference for other young farmers involve in business management of tea industry. The four respondents of this survey are selected from two members of team and one tea farmer (who starts own business) who come from “2nd special case for guidance young farmers, COA”, one local tea farmer (who starts own business, but does not come from “2nd special case for guidance young farmers, COA”). This survey uses semi-structured interview method. The results show that when they involved in the production and marketing lines of tea industry, all of them have full of hope, keep high interesting, be willing to do continuing learning and accept new knowledge. But they also know that they have insufficient funds, and they also should have filled in related technology and knowledge. We have concluded that young tea farmers need to focus on key points include three stages and seven domains based on reference information and analysis results. The four respondents consider the main critical success factors are what they should possess enthusiasms and motive power, they are willing to do continuing learning and accept new knowledge.

Key words: Young tea farmer, Tea Industry, Business Management, Critical success factor

Research on the Follow-up Evaluation of Training Effectiveness (Skill of Tea Sensory Evaluation) for Taiwan Tea Farmers - the Example of Primary Training Courses of Tea Industry

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Summary

The main issues of tea industry development at present are economic downturn, import competition and climate change which impact on tea production. The purpose of this study is to investigate the current knowledge, technical ability, working requirement of tea industry operated by tea farmers and the results could be reference resources for future counseling. Follow-up survey can comprehend both problems and assistance trainee required during tea management after completed the training courses. The results show that the farming backgrounds (ex., Farming area and seniority) possess significant relationship for ability enhanced after training. According 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 farmers' guidance.

Key words: Tea farmer, Competence of tea tasting, Evaluation of training effectiveness