# The Breeding of New Cultivar TTES No. 25

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## Summary

The new cultivar of tea tree "TTES No. 25" is a hybrid descendant of Burma, a large-leaf species in 1992 by the Tea Research and Extension Station, the Council of Agriculture of the Executive Yuan. After single plant selection, strain comparison and characteristic verification test, the nomenclature was passed on April 26, 2021, and obtains breed rights on June 6, 2022. According to the results of kinship analysis, it is biased towards the hybrid population of large-leaf species and small-leaf species in the principal component vector analysis diagram. In addition, according to the results of the genetic distance and the parental prediction analysis of the paired genes, the genetic distance between TTES No. 25 and No. 13 is the closest. Because the paired genes of TTES No. 25 in the 12 groups of molecular markers are consistent with TTES No. 13, it is speculated that the male parent is TTES No. 13.

The tree type of TTES No. 25 is semi-arbor type, intermediate tree type, strong tree vigor, young buds and leaves are purple-red in four seasons, it is the first purple bud cultivar in the Taiwan Tea Experiment Station (TTES) number and member series, and its anthocyanin content is 50 times that of the control cultivar TTES No. 18. It has a floral fragrance and is suitable for making black tea and green tea. Green tea is light purple in color. When it is dripped into an acidic drink, the tea liquid immediately turns colorful and charming pink. This is one of the major features of this cultivar. It can be used for hand shake or developed into a natural pink color drink. It has great potential for development; the purple-red buds and leaves can increase the diversity of landscape colors, and can be used in horticulture and landscape construction. It is a new cultivar with both ornamental and drinking value.

**Key words**: TTES No. 25, Anthocyanin, Black tea, Green tea

# Study on Optimization of Pollen Viability Test Formula of *Camellia* Plants and Pollen Viability of Tea Varieties

Shi-Kai Lo Chih-Yi Hu Chiou-Fang Liu Jian-Hsing Shiau
Su-Fen Roan Iou-Zen Chen

## Summary

Pollen viability detection is very important for breeding. This experiment compared the effects of different pollen germination culture medium and 2,3,5-triphenyl tetrazolium chloride (TTC) staining formulas on pollen viability detection of tea (*Camellia sinensis*), *C. tenuifolia* and *C. oleifera*. The results show that, the better formula of pollens germination culture medium for tea, *C. tenuifolia* and *C. oleifera* is "100 g $L^{-1}$ sucrose +150 mg $L^{-1}$ boric acid +200 mg $L^{-1}$ calcium nitrate", The better formula of TTC staining for tea and *C. oleifera* pollens is "100 g $L^{-1}$ sucrose + 5 g $L^{-1}$ TTC". Using TTC staining method can achieve ideal results of pollen viability detection, and adding sucrose can maintain

the integrity of pollen, which is convenient for long-term observation of pollen staining. The pollen viability of 75 tea varieties was detected by TTC staining, and about 80% of them had higher than 70% pollen viability, but only TTES No. 19, ‘Shui Xian’ and ‘Xiao Ye Tie Guan Yin’ had lower pollen viability, which indicated that most tea varieties could be used for cross breeding.
**Key words**: *Camellia sinensis*, Variety, Pollen viability, Pollen germination, TTC staining

# Research on the Application of Tea Residues with Beneficial Fungi and Granular Organic Fertilizer in Tea Garden

Ming-Tzu Chiu Bo-Jen Chen

## Summary

Using the mixed embedding technology, Trichoderma was added to the organic fertilizer and compressed into a granular test fertilizer. Every 25 kg of fertilizer contained 1 kg of tea residues, and the tea residues were recycled use. The tea residues were inoculated with Trichoderma species, and its reproduction and growth rate is rapid. In the winter of 2019 year, the harvested amount of tea leaves of the test fertilizer 17.1±0.8 kg was significantly higher than the control group 13.8±1.7 kg. In the spring of 2020 year, the test group 35.5±7.6 kg was significantly higher than the control group 23.8±9.9 kg. Comparison of agronomic characteristics, the growth of tea buds and shoots of test fertilizer showed better performance. Sensory evaluation showed that the test group had better performance in aroma and taste than the control group. Chemical composition analysis of tea, the theanine in the freshness of the tea liquor is higher than that of the control group, whether it is winter tea or spring tea. Determination of soil microbial metabolic diversity analysis by EcoPlate TM showed that the test group was higher than the control group in terms of carbohydrate utilization. The PCA of average utilization from the carbon sources of soil microbiology showed that soil microbial and enzymatic activities of the test group were significantly higher than those of the control fertilizer.
**Key words**: Tea residue, Soil microorganism, Enzyme activity, Trichoderma

# Study on the Effect of Black Tea Residues as Feed Additive on the Growth of White Roman Geese

Ching-Hua Chien Sheng-Der Wang Daniel Yuen-Teh Liu
Cheng-Chung Huang

## Summary

In order to increase the diversified application of tea residues produced by beverage processing,

this experiment uses black tea residues and tea residues microbial-fermented by *Aspergillus niger* as feed additive in White Roman goose feeding experiment. The first part of the experiment was to add 2.5%, 5%, 7.5%, and 10% of black tea residues to replace alfalfa powder in the diet. The second part of the experiment was to add 2.5%, 5% of microbial-fermented tea residues and 5% tea residues replaces alfalfa powder. The tea residues were added during the geese feeding period from 5 to 13 weeks old, and the treatment with 10% alfalfa meal was added as the control. The results show that the average feed intake and average daily weight gain of geese treated with 2.5% tea residues are not significantly different from those of the control. The feed conversion rate was significant better than that of the control; serum analysis showed that the blood sugar and triglyceride levels of the 2.5% added were significant lower than those of the control; the carcass traits survey results showed that added tea residues or microbial-fermented tea residues to the feed can reduce the weight of abdominal fat mass in 13-week-old geese as a percentage of slaughter weight. There is no difference of the live weight and slaughter weight between 2.5% tea residues and the control. As the proportion of tea residues increases, the slaughter weight of geese was significantly decreased. Based on the results, it is recommended to add tea residues to the feed after the White Roman geese are 5 weeks of age, and the added amount no more than 2.5% both tea residues and microbial-fermented tea residues. Tea residues can be used as a partial feed alternative source without affecting production efficiency.
**Key words**: Black tea, Tea residue, White Roman geese, Feed additive

# Developments of Pesticide Reduction Management Module for High Mountain Tea Garden: Case of Tea Plantations in Meishan & Renai Townships

Shiou-Ruei Lin Yu-Ju Huang Hsiao-Ying Yang Jia-Ru Dai

## Summary

In general, the pest management of tea gardens relies on the chemicals. The investigation showed that Taiwan tea gardens use 34.72 kg of chemical product per hectare per year average. With the rise of environmental awareness and food safety issues, it is one of the most important issues to reduce the use of chemical pesticides. In this study, the tea plant diseases and insect pests were grouped, and the local tea gardens were introduced for customized pesticide-reduction technology. The feasibility of pesticide-reduction for tea management technology module was verified. This study took the tea plantations in high mountain areas, included Meishan Township in Chiayi County and Renai Township in Nantou County, as examples. First, investigate the pesticides utilization history of the previous year (2018) of the demonstration tea garden, and then adjust the pesticide use by coupling with farmers' habits and the occurrence of pests. The result showed that there was no difference between the monitoring results of the pests in the test area and the control area. The usage of the active ingredient of pesticide could be reduced by more 42-47% in test area. The production cost of the test area was around 50% less than that of the control area, it attained to 3,600 to 11,000 NTD per season per hectare. The tea pesticide residue detection results of test and control areas were all meet the national standards. Furthermore, the types of detected pesticides in the test area are less than the control area. There was no

significant yield difference between the test area and the control area. It reached the goal that to reduce the pesticides usage and maintain the final yield at the same time. Furthermore, we built a self-directed inspection of capacity of pesticide-reduction utilization in this study for starting the first step. With the characteristics of tea plantations in high mountain area include stable climate, pests occur regularly, disciplined filed management, and intensively pests control compare to lower altitude tea plantations. We command the model of pesticide-reduction use of tea in high mountain areas would contain to choose the broad-spectrum pesticides, not to use the same pesticide continuously, to avoid to choose the pesticides with same mechanism, and to induct the prevention idea of prescription design. Reasonable pesticide reduction management can not only lower down production costs, but also maintain yield. Moreover, it could produce safer tea raw materials, which not only protects the environment but also protects the health of producers and consumers.
**Key words:** Pest control, Alternation use, Mechanism, Customized

# Study on Friendly-farming Substances for Pest Control and Ecological-friendly Cultivation Model of Tea Gardens

Chih-Yi Hu Guo-Zhong Hsiao Chin-An Yu Bo-Jhen Chen
Chien-Ju Liu Jian-Hsing Shiau

## Summary

The aims of this study were to establish ecological-friendly cultivation methods, and choose suitable ecological-friendly substances used for pest control in tea gardens. Tea Research and Extension Station (TRES) had tested many friendly-farming substances in Wenshan and Taitung Branches of TRES during 2017-2020. The results showed that the testing substances including soapberry extract, mineral oil, diatomite, chitin and oil emulsifier were able to inhibit the density of pests including *Jacobiasca formosana*, *Aleurocanthus*, and *Tetranychidae*, and these ecological-friendly substances showed no effect on the yields of tea leaves and quality of teas in above tea gardens, and thus could be recommended to farmers although they must be used in more times and cause higher costs. According these results, in Taiwan, the northern tea areas with organic cultivation could spray soapberry extract and mineral oil in spring, while the diatomite, chitin and potassium salts of fatty acids could use in summer and winter, and also suitably use for the eastern tea areas. By establishing a tea garden cultivation management model, it provides Ecological-friendly substance formulas as a basis for organic friendly farmers to use.
**Key words**: Ecological-friendly Cultivation Model, *Camellia sinensis*, Ecological-friendly substance, Pest control, Diatomite, Mmineral oil, Chitin, Potassium salts of fatty acids

# Effect of Tillage System on Pests in Chrysanthemum Fields and Control Effects of Mealybug

Chiou-Fang Liu Yu-Jen Chen Tung-Hsen Liu Hsuan-Jen Pan
Hsien-Tsung Tsai

## Summary

In order to reduce using pesticides and pesticide residues, we laid silver polyethylene (PE) and rice straw (RS) to cover the beds and hang yellow sticky paper and pheromone trap box in non-preventing control chrysanthemum garden in Taitung City, Taitung County and Tongluo Township, Miaoli County in 2021, investigate the harm situation of chrysanthemum pests every month. In addition, hang yellow sticky paper and pheromone trap box on the PE mulching bed of using pesticides chrysanthemum field, compare pests with non-control field. The results showed that there were different differences in the number of cotton leaf worm (*Spodoptera litura*) in different months, There are no significant differences in the number of cotton bollworm, beet armyworm, whitefly, and thrips in PE and RS treatments. The number of whitefly in PE treatment was significant higher than RS in Taitung city, the number also increased month by month. There was no significant difference between the number of thrips in PE and RS treatments, and the number of thrips in the two treatments showed a trend of decreasing month by month. Analysis of pest harm rates in Tongluo Township showed that moths and mealybugs had significantly higher PE than RS, the harm degree was also significantly higher than the RS. However, before the harvest (November), the harm rate and degree of mealybugs are naturally decreased; There was no significant difference between the moths harm rate and degree of PE and RS in Taitung city, and no harm of mealybugs or lace bugs occurred. There are different control methods and geographical environment between conventional and non-control fields. The harm rate of moths in the conventional fields was higher than that of non-control fields, but the harm rate of mealybugs and lace bugs in the conventional fields was 0%, and no harm occurred. The results of PE and RS soil temperature showed that the soil temperature of PE topsoil (5 cm) or subsoil (20 cm) was higher than that of RS for most of the time, and PE would make chrysanthemum grow in high temperature environment for a long time, which is the reason to weaken the plant and make more serious pests. Chrysanthemum recommends the use of Acetamiprid and Dineotfuran, and the mealybugs are soaked in the liquid at the recommended multiples, achieving a significant control rate on the first day compared with other pesticides, and non-pesticide materials are also significantly effective in prevention and control rate of calcium polysulfide, but it will only be effective until the seventh day. In conclusion, the results show that the mulching materials and application conditions will affect the occurrence of chrysanthemum pests. Straw mulching can reduce pests and the soil temperature effectively. In the future, you can plan the prevention and control test of the mealybug fields. Confirm the results of the test results such as Acetamiprid, Dineotfuran and lime calcium polysulfide in order to facilitate pesticide registration extension.

**Key words**: Chrysanthemum, Mulching, Mealybug

# Study on Variation of Leaf, Tea and Tea Liquid Color Difference and Their Relationship with Quality of Yung-Kang Wild Tea in Taitung

Hun-Yuan Cheng  Horng-Jey Fan  Chin-An Yu

## Summary

This experimental research was used Taitung Yung-Kang wild tea collected from Taitung Branch, Tea Research and Extension Station as the experimental material to carry out investigation and analysis of leaf color, tea color, liquor color and chlorophyll content, and hope to establish color and liquor color variation and correlation data of Yung-Kang wild tea, as well as the relationship between it and the tea quality, were used as a reference for the selection of individual plant on the tea tree breeding, development and utilization for the numerical application of color. The experimental results show that the variation size of the color difference of Yung-Kang wild tea leaf was b>L≒a>ΔE. The color and tea liquid of green tea and black tea were a>b>L>ΔE, a≒b>L>ΔE and a≒ΔE>b>L. a>ΔE>L≒b. The higher the green tea chlorophyll and carotenoids contents, the higher the leaf SPAD and a value, and the lower the L and b value. The higher L and b values of color and tea liquid of green tea and black tea, the higher the leaf L and b value in most tea seasons, and the lower the a and SPAD value, the higher a value of green tea color and tea liquid, the lower the value of leaf L and b, a and SPAD value were higher. The higher a value of black tea color, the higher the leaf L and b value, the lower the a and SPAD value, and the a value of black tea liquid had almost no significantly correlation. The leaf color L, a and b value were greater effect on the green tea quality than that black tea, especially the color and liquor color. The SPAD value, chlorophyll and carotenoids contents were positively correlated with the green tea quality and its various evaluation items in most tea seasons, and they have a significant or extremely significant relationship with the color. The L, a and b values of green tea were greater effect on the color than that black tea. The L and a value of green tea liquid and color, quality reached a significant or extremely significant positive correlation in most tea seasons, the b values of tea liquid mostly had a significant or extremely significant negative correlation. The L value of black tea liquid and liquor color, quality was showed a significant or extremely significant negative correlation in most tea seasons, the a and b values of tea liquid had a significant or extremely significant positive correlation with shape, color, liquor color and quality in some tea seasons.

**Key words**: Yung-Kang wild tea, Color difference, Quality

# Effect of Different Drying and Storage Methods on the Quality, Liquor Color and Chemical Components of Raw Material and Made Tea for Compressed Tea of Yung-Kang Wild Tea

Hun-Yuan Cheng Horng-Jey Fan Chin-An Yu

## Summary

The purpose of this experiment was to understand the effects of different drying and storage methods on the quality, liquor color and chemical components of raw material and made tea for compressed tea of Yung-Kang wild tea, so as to serve as a reference for the processing of different tea types of Taiwan-made compressed tea materials. Green tea, strip type Paochong tea and black tea were made from Yung-Kang wild tea. Different drying methods include hot air drying, hot air drying directly after rolling, sun drying after hot air drying, sun drying directly after primary drying and sun drying directly after rolling. The results show that the quality of Yung-Kang wild tea without storage of different teas type by hot air drying was better than sun drying directly after rolling, while the quality of sun drying directly after rolling was significantly better than hot air drying after storage for one to two years, or the difference was not obvious; and the quality of sun drying directly after rolling was better than that of other drying methods. The sun drying directly after rolling quality of different teas type was transformed from green and astringent taste to sweet, mellow, fruity or plum fragrance, which was suitable for making compressed tea. Although the liquor color of the tea soup after sun drying directly after rolling tends to turn red to yellow, the L, a, b and ΔE values of the tea liquid between the drying treatments before and after storage were mostly not significantly difference. The chemical components of different drying treatments were different level due to the tea types. Only some of the results reach significant difference, with or without storage had the same results. Among them, the contents of caffeine and soluble sugar were hardly affected by the drying treatments.

Key words: Yung-Kang wild tea, Compressed tea, Quality, Liquor color, Chemical component

# Research on Scientific Grading Indicator of Wenshan Paochong Tea

Chih-Chun Kuo[1] Ya-Jou Huang[2] Hsuan-Han Huang[1] Meei-Ju Yang[1,*]

## Summary

Wenshan Paochong tea is a unique tea in Pinglin District, New Taipei City. It belongs to the fragrant strip-shaped Paochong tea. Professional tea tasters grade the tea according to the qualities of tea appearance, liquid color, aroma, taste, and the infused tea leaves. In order to establish the scientific grading indicator of Wenshan Paochong tea, different grades of tea samples from the 2019 spring

competition were collected for composition and liquid color analysis. The results show that if the tea sample has the higher a* value of liquid color and the lower ratio of theanine to total free amino acids, the grade would be lower. These two indicators can significantly distinguish the tea samples of awarded tea, but the merit award and eliminated tea samples couldn't have a good separation effect. Therefore, we further analyzed the volatile organic compounds. The results show that Benzaldehyde, 2-Ethylhexan-1-ol, Benzeneacetaldehyde, 3-methylbutyl hexanoate, β-Pinene, Geranyl butyrate and Dodecane can be used as indicator components, which can effectively distinguish the merit award tea samples from the eliminated tea samples. Based on the above research results, the negative indicators ß-pinene and 2-Ethylhexan-1-ol are selected, and the value of a*, the ration of theanine to total free amino acids can be used to effectively distinguish the different grades of Wenshan Paochong tea. Therefore, these indicators can be used as a reference basis for scientific grading.
**Key words:** Wenshan Paochong tea, Quality, Chemical composition, Volatile organic compounds

# Improvement of Processing and Roasting Technology of Fragrant Strip Type Paochong Tea

Wei-Cheng Pan Chih-Chun Kuo Cheng-Huan Chang Yu-Liang Chien

## Summary

In order to improve the quality and stability of the fragrant strip type paochong tea, this experiment was made by increasing the degree of withering and increasing the stirring time, and combined with the roasting technology to produce the fragrant strip type paochong tea (collectively referred to modified strip type paochong tea). The weight loss rate of the test tea leaves was 15% to 20% with solar withering, and the cumulative stirring time was 40 to 50 minutes. The harvesting length of tea leaves is better with 1 bud and 3 leaves than 1 bud and 4 leaves. The quality of hand-picked tea leaves is better than that of mechanically harvested tea leaves. The aroma and taste performance is better when the roasting temperature is 115℃ than 105℃. The results of a questionnaire survey on the preference of modified strip type paochong tea show that the interviewees prefer the processing method of 1 bud and 3 leaves of the tea leaves to harvest length and the roasting temperature of 105℃. Comparing the chemical components difference between the modified strip type paochong tea and the fragrant strip type paochong tea, the contents of catechins and theanine were higher in the fragrant strip type paochong tea, and the contents of gallic acid and caffeine were higher in the modified strip type paochong tea. The appearance of modified strip type paochong tea is characterized by oily and tightly knotted strands, bright amber liquid color, and high aroma with floral flavor, sweet taste and obvious aftertaste.
**Key words**: Tea Processing, Roasting flavor

# Developments of Remote Monitoring System of Tea Roasting Machine

Cheng-Hou Chang Jih-Chih Lin Tien-Lin Liu

## Summary

The tea roasting operations are mainly used cabinet-type electric roasting machine, which is time-consuming and labor-intensive because it needs manpower to operate and record roasting parameters for a long time and the tea roasted quality affected by personnel fatigue. Due to operating time and space constraints of the roasting machine, manpower cannot be used effectively, so it is necessary to improve. This study re-designed the structure of the traditional tea roasting machine, and integrated information communication and automatic control technology to develop a new type of tea roasting machine with monitoring system, the prototype machine which main size of 79×65×162 cm and tea roasting capacity about 25 kg, the monitoring system uses RS-485 transmission and 4G-LTE wireless communication module to integrate human-machine interface and automatically transmit and store data to cloud computer. The operator can remotely monitor the status of the roasting machine, operating parameters and sensing data in real time, download and analyze the historical data, and can set or adjust parameters of machine according to the needs. The new type of tea roasting machine can improve the functionality and convenience of tea roasting operations and reduce the manpower and operation time to achieve the purpose of saving labor and time.

**Key words:** Tea, Roasting machine, Human machine interface, Remote monitoring

# An Evaluation of the Applicability of Tea Leaves Automatic-stirring Machine

Tien-Lin Liu Wei-Yang Hwang Tern-Feng Huang Chin-Liou Lee Cheng-Hou Chang

## Summary

In the production process of partially fermented Oolong tea in Taiwan, the withering operation mainly adopts the Multi-tier withering rack. Although it is a semi-automatic operation, the stirring operation of tea leaves still needs to be carried out manually. Therefore, the repeated withering and stirring operations of tea leaves cannot be automated. The automatic discharging mixer developed by the predecessors can achieve the functions of convenient feeding, automatic stirring and discharging tea leaves. After modification, the automatic adjustment of the rotary rake can control the tea leaves discharging speed and stacking thickness. However, there is still the problems of overflowing and remaining of tea leaves in the rear side of the machine. In the future, with some structural improvements of the stirring machine, it is expected to be suitable for serial connection to the Multi-tier withering rack for automatic withering and stirring operations.

**Key words**: Oolong tea, Automatic, Withering

# Test and Improvement of the Hanging Tea Planting Machine Attached to the Traction Machine

Wei-Yang Hwang Tien-Lin Liu

## Summary

The purpose of research which design and develop a semi-automatic tea seedling planting machine, that can prompt the mechanization of tea seedling planting, reduce the labor cost, and solve the problem of labor shortage in rural areas. The main structure of the planting machinery in this study includes transmission mechanism, a seedling turntable and a ditching planting mechanism. The seedling turntable has two groups, left and right, designed as six cylindrical seedling cups with a height of 15 cm and a diameter of 10 cm. The operator can take out the seedlings and put them in the seedling cups. The shutter will open automatically, and the seedlings in the seedling cup will fall into the trenching planting mechanism. There is a plowshare in front of the seedling opening of the trenching planting mechanism. It wills backfill automatically, and the tea seedlings can be buried upright at the bottom of the ditch. The tea seedling planting machine is powered by a traction machine with more than 40 horsepower. The tea planting machine is 120 cm long, 180 cm wide and 180 cm high. It is suitable for planting double rows of tea seedlings at the bottom of the trench with a width of 160-180cm. The left and right row spacing of the plants can be adjusted by 20-40cm, and the front and rear plant spacing can be adjusted by 40-60cm. The tea planting machine can operate 1 hectare a day. The planting efficiency of single row can be increased by five times than labor working, and the planting efficiency of double rows can be increased by six times than labor working.

**Key words**: Tea planting machine, Labor shortage, Tea seedling

# Application of High Barrier Packaging Materials in Tea Packaging

Cheng-Huan Chang Wei-Cheng Pan

## Summary

This project used EVE film (LLDPE/EVOH/LLDPE) and matches with other materials to produce 4 kinds of composite film tea packaging bags with EVOH structure, which were compatible with commercially available tea packaging bags (Structure A: Aluminum foil structure and Structure B: Evaporated aluminum structure) for comparison, same physical property analysis such as water and oxygen permeability, tensile strength, heat sealing strength, drop resistance test and safety were

conduct. The composition and sensory evaluation of the packaged and stored tea were also conducted to verify the product performance and the film structure with better barrier properties and impact resistance was suggested to be suitable for tea packaging bags.

It meets the properties that a good tea packaging bag must have: 1. water vapor barrier, 2. oxygen barrier, 3. impact resistance and 4. heat seal ability. The results showed that the developed 4 kinds of tea packaging bags were superior to the comparison commercial tea packaging bags in the tests of water and oxygen barrier properties, tensile strength, heat sealing strength, and drop resistance, which meet the needs of the industry. Using green tea, Wen-Shan Paochong tea and high mountain tea stored in normal and high humidity high oxygen environments to conduct composition and sensory evaluation analysis and verification, No. 1, 2, and 3 packaging bags can effectively preserve the quality of tea in the more extreme (high humidity, high oxygen) storage environment. No. 4 and Structure-B bags are not suitable for long-term storage of teas.

**Key words**: Tea packaging bags, High barrier material, Tea storage

# Research on Evaluation Effectiveness of Training in the Farmers' Academy and Influencing Factors of Willingness to Stay in Agriculture: the Case of Tea Field Management and Processing Advanced Classes

Ting-Mei Kuo Yi-Hao Lin Cheng-Nan Lai Jin-Chin Lin

## Summary

This study investigates the training effectiveness of tea field management and processing advanced classes in the Farmers' academy and influencing factors of willingness to stay in agriculture of operated by trainees who participated in the Farmers academy's tea industry class in 2011-2020. An online questionnaire was distributed to 347 trainees. A total of 83 valid questionnaires were collected, with an effective recovery rate of 23.9%.

According to statistical analysis, there are significant differences between the basic information of the trainees and their agricultural characteristics (including gender, marriage, number of long-term employees, participation in work projects, etc.) and personality traits, grit and intention to stay in agriculture. There is a higher linear relationship, but compared with personality traits, grit has a higher explanatory power for the intention of staying in agriculture. In addition, according to the follow-up survey on the current business status of the trainees, the performance levels after the training are as follows: 19.2% of the trainees expressed that the number of employees was increased after the training, 30.1% of trainees expressed that operating costs have decreased, 46.9% of trainees have expressed that business area increased, 60.2% of trainees expressed that operating profits have increased, 62.6% of the trainees expressed that the total production increased, 68.6% of the trainees expressed that product sales increased, as high as 92.6% of the trainees expressed that product quality has improved. The results of the investigation of the impact of the "COVID-19" pneumonia epidemic showed that up to 69.9% of the trainees expressed that product sales decreased, 66.1% of trainees expressed that operating profits have decreased, 44.6% of trainees expressed that operating costs have increased, but only 15.6% of the trainees expressed that the number of employees was decreased. In General, most of

the trainees' business conditions have grown after the training, but the pneumonia epidemic still has a great impact on the operating conditions, especially the decrease in product sales and operating profits. The results of this study can be used as a reference for the selection and admission of trainees of the Farmers' academy in the future, so as to facilitate the effective use of training resources.
**Key words**: The Farmers' academy, Personality Traits, Grit, COVID-19 pneumonia

# Research on Training Effectiveness of Professional Talent of Tea Sensory Evaluation: the Case of the Elementary Class of Tea Sensory Evaluation

Ting-Mei Kuo Wei-Cheng Pan Yi-Hao Lin Cheng-Nan Lai
Jin-Chin Lin

## Summary

This study investigates the training effectiveness of professional talent of tea sensory evaluation by students who participated in the elementary class of tea sensory evaluation in 2016-2018. The questionnaire is designed about total of 6 constructs and 35 items which about tea sensory evaluation knowledge and skills, tea manufacturing technology, tea tree cultivation, history and culture, moral and regulations. An online questionnaire was distributed to 1,120 trainees. A total of 263 valid questionnaires were collected, with an effective recovery rate of 23.5%.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. In addition, according to the follow-up survey on the current status of the trainees 'results, as high as 85.6% of the trainees expressed that product quality has improved, 69.2% of the trainees expressed that product sales increased, 65.0% of trainees expressed that operating profits have increased, 44.1% of the trainees expressed that the total production increased, 34.2% of trainees have expressed that business area increased, 30.0% of trainees expressed that operating costs have decreased, and 20.2% of the trainees expressed that the number of employees was increased. In general, most of the trainees' business conditions have grown after the training. In addition, according to the results of the open-ended questionnaire survey, more than two-thirds of the trainees are willing or have recommended others to participate in the preliminary training of tea sensory evaluation, and more than half (54.4%) of the trainees 'willingness to participate in the intermediate training of tea sensory evaluation have expressed that they have participated, 41.8% of the trainees expressed their willingness to participate, and as much as 87.8% of the trainees expressed their willingness to participate in the advanced training of tea sensory evaluation. The results of this study can be used as a reference 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

# Discussion on Accounting Behavior and Counseling Needs of Young Tea Farmers of the Agriculture Second Generation

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## Summary

In order to make more tea farmers willing to adopt and learn more innovative technologies or take the initiative to cooperate with other tea farmers across domains to assist them in the improvement of tea business management, investigates the concept of tea farmers' financial management and uses semi-structured questionnaire interviews to sample in 2021. The subject is investigating the motives, current situation and needs of agricultural bookkeeping in the current business process, as a reference for counseling from farmers. The survey subjects used the method of " purposive sampling" and randomly selected 4 young farmers from Nantou County, 1 young farmer from Chiayi County and Taipei City (all they are 28 to 40 years old) from the two classes of 2021 intermediate sensory evaluation class. All are the second generation of farmers. The results of the survey and analysis show that most young farmers or their family members have the habit of bookkeeping. The young farmers agree that the basic concept of farm accounting is very important to them and that any method of bookkeeping management has many benefits, but the demand for bookkeeping is insufficient. The expectation for using information software to bookkeep is that there are many functions and input interfaces, and the input interface should be user-friendly, changeable, expandable functions. Young farmers put forward several requirements for the use of the "Nonglaiji" software (or other application software) developed by the Agriculture and Food Administration, such as: the software should provide teaching functions, data record analysis, and basic functions of cost-benefit analysis, and the fee of accounting software should be low, and the function does not need to be too powerful, but it needs to have a warning function and provide instant online customer service. The counseling needed by the government to assist young farmers in financial management includes providing software teaching services, reporting learning status to counselors on a regular basis, explain the amount of government subsidies, assist manufacturers in matchmaking, conduct training courses in various tea districts, and set up online consultants, etc.

**Key words**: Farm bookkeeping, Accounting information software, Financial management counseling