PROCESSING QUALITY RICE LEAF TEA UNDER ARTIFICIAL LIGHT CONTROL

[1]CHALINDA ARIYADET, [2]THITIWAT RATTANAMANEE, [3]SIRIWAT SAKHONWASEE, [4]PAISARN KARNCHANAWONG

[1,2] Program in Agricultural Interdisciplinary, Faculty of Engineering and Agro-Industry, Maejo University, Chiangmai, Thailand
[3]Program in Horticulture, Faculty of Agricultural Production, Maejo University, Chiang Mai 50290, Thailand
[4]School of Tourism Development, Maejo University, Chiang Mai 50290, Thailand.
E-mail: chalinda.bio@gmail.com, tongscpl@yahoo.com, paisarn77@gmail.com

Abstract - To assess the effects of light quality on 6 variety rice seedlings of Oryza sativa Linn. for develop the green tea product. Investigate the %germination for consistency of rice seedling per area. Using 14 days after germination of 3 white seed cultivars RD10, Thai Pathumthani fragrant, Khao Dawk Mali 105 and 3 red seed cultivars, RD69, Black Jasmin rice and Black Gluten Rice. The Biomass, the beneficial health chemical composition, The Impact health chemical composition and Questionnaire of the selected tea were observed. The methods of green tea processing were studied in order to find out the most suitable way to produce green tea product under light quality control. The results showed that green tea products from all 6 rice cultivars were almost similar in term of color and size. The selected green tea was Khao Dawk Mali 105 under red light condition which was greater aroma taste and β-glucan (2.7 $g.100g^{-1}$.), with the lower content of tannin (0.191±0.02 $mg.Kg^{-1}$) and caffeine (71.5±0.00 ppm.)than others.In conclusion the influences of LED light quality to rice seedlings green tea grown in a semi-closed system have seem to be clear to effect of the product contents. 201 persons were selected to drink trial Khao Dawk Mali 105 rice tea include of students, government officials, businessmen, housewives and private entrepreneurs. There were 22.8 percent coffee drinkers, 21.1 percent tea drinkers and 55.7 percent daily-drink. The results have shown that they were satisfactory in safe and useful of products(4.48±0.68). The score of 4.51±0.72 liked the smells and the most prominent features (4.12±0.79and 4.05±0.89) respectively. It is unique in the packaging and could be become to market product of the value of 3.81±0.72

Index terms - Processing, quality, rice leaf tea, artificial light

I. INTRODUCTION

The agriculture in Thailand is highly competitive, diversified and specialized and its exports are very successful internationally. Rice is the country's most important crop, with some 60 percent of Thailand's 13 million farmers growing it [1]. The farm value in real dollars (adjusted by the Consumer Price Index, with 1982-1984 being the base years) has remained nearly constant, but the costs of processing and marketing have continued to increase. Currently, people are more interested in health care than waiting for treatment when they are sick from the concept of Thailand 4.0, which is a development strategy [2]. Create value with interdisciplinary science. Effect on health. Livelihood and income Rice Tea is one of the most widely consumed beverages in the world, next to water [3,4].Value added with growth factors that increase nutritional value, safety, age and health benefits. Several studies have shown that β-glucan have positive effects on cholesterol, glucose and insulin metabolism [5]. Unlimited drink Reduce production costs by using technology to control main growth factors and increase the amount of compounds in rice tea. This is a concept in this research. The objective is to obtain more nutritious and nutritious tea products. Tea contains several bioactive compounds that are believed to have a wide range of physiological proper. Some substances in tea such as tannin and caffeine are restricted to people and ages. The idea is to find the tea that can solve the problem. Including increasing the value of tea under LED light condition, which was record to increase the beneficial health chemical composition, such as biomass and phycocyanin content[6],β-glucan content[7]. Rice tea is a new alternative and has been widely studied in the present. The aim of this study was to follow the previous study which was report about the cultivation of rice seedling and the beneficial health chemical composition such as chlorophyll, Protein, Vitamin and β-glucan content[7]. In this study was public relate to the Impact health chemical composition and Questionnaire of the selectedrice tea for the benefit of marketing product.

II. CULTIVATION

This study was carried out at Maejo University,Interdisciplinaryagriculture laboratory, Chiangmai Province, Thailand. The 6 variety rice seedlings of Oryza sativa Linn. 3 white seed cultivars RD10, Thai Pathumthani fragrant, Khao Dawk Mali 105 and 3 red seed cultivars, RD69, Black Jasmin rice and Black Gluten Rice. The rice seeds were planted in 30 x 60 x 4 cm. PVC trays and media was using 2 kg. per tray compost soil and seed weight was follow the %germination of each variety under the purpose of the consistency of plant density(Fig.1). The irradiance source were LED with the intensity of

50 µmol m^{-2} s^{-1} in Red light and 250 µmol m^{-2} s^{-1} in white light by mean to focus the lower energy to compare higher energy in white light source which could to save the cost and may be high quality income. The treatments include watering a 100 ml. water once a day.The result have shown that % Dry weight and Yield under Red-light condition were higher than White-light condition, except RD69 in%Dry weight and RD10, BGR in yield. The range of %Dry weight was 16.00-19.79 in Red-light and 15.00-20.59 in White-light and biomass was 56.86 - 117.71 g.150 G^{-1} seed.(Fig.1)

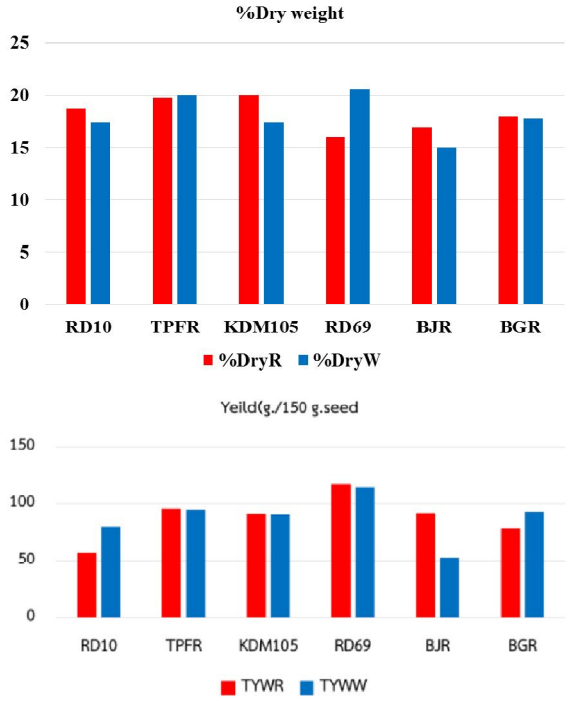


Figure1. The %Dry weight and Total yield weight of 14 days 6 rice seedling under Red-light and White-light condition

III. BENEFICIAL HEALTH CHEMICAL COMPOSITION (Fig 2).

A. Chlorophyll

Chlorophyll is green pigment found in plants. Chlorophyll has the function of synthesizing or converting light energy into starch and sugar helping the human body to reduce its energy supply. The risk of liver cancer. Breast tumor Increase the number and performance of white blood cells. It also helps to detoxify [8]. Chlorophyll content was determined on the flag leaf using methods of [9]and [10]. Black Gluten Rice (BJR) green tea have the maximum chlorophyll a value of 1.75±0.03 mg.g-1 in white light condition and white light also show the higher value than those of red light condition. The lowest chlorophyll a was shown in KDM105 with the value of 0.289±0.07 mg.g-1 under red light condition.

The chlorophyll b content was maximum in BJR with the value of 0.99±0.22 mg.g-1 underwhite light condition. The lowest chlorophyll b was shown in KDM105 with the value of 0.22±0.09 mg.g-1 under red light condition. The range of chlorophyll was 0.222±0.9 –1.747±0.23 mg.g-1.

B. The Protein content

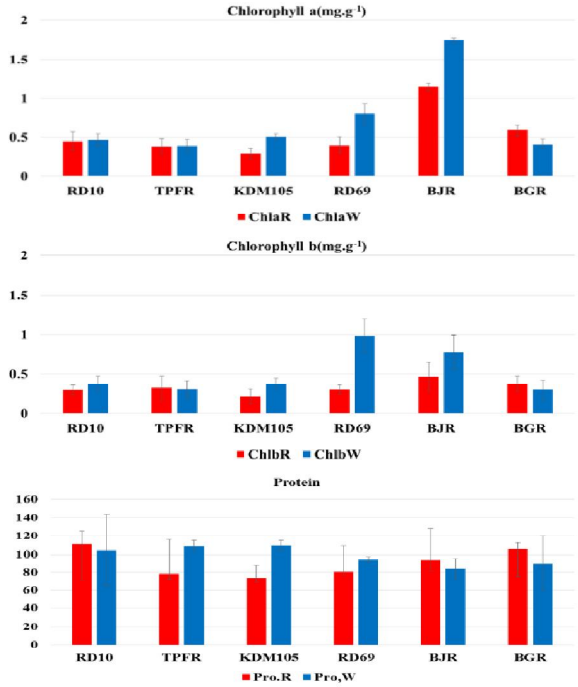
The protein content of BGR green tea have the maximum protein value of 111.53±30.60 mg.L-1 under white light condition. The lowest protein concentration was shown in (KDM105) with the value of 65.07±14.09 $mg.L^{-1}$ under red light condition.

C. Vitamin C content

Vitamin C, also called ascorbic acid or ascorbate, is an essential vitamin and antioxidant that occurs in nearly all fresh fruits and vegetables. The vitamin C content of tea depends on how the leaf is processed; there are few studies that actually measure the vitamin C content of various teas[11]. The vitamin C content of BJR green tea have the maximum value of 3.18±0.16 $mg.100g^{-1}$under red light condition. The lowest vitamin C content was shown in RD10 with the value of 1.42±0.03$mg.100g^{-1}$under white light condition. The vitamin C content under difference light quality was varied in type of rice.

D. β-glucan content

Several studies have shown that β-glucan have positive effects on cholesterol, glucose and insulin metabolism (Traore et al., 2009). The β-glucan content of KMD105 green tea have the maximum β-glucan content value of 2.7 $g.100g^{-1}$under red light condition. The lowest β-glucan content was shown in BJR with the value of 1.1 $g.100g^{-1}$under white light condition. The β-glucan content under red light condition was shown the higher volume than white light condition at all type of rice. The range of β-glucan was 1.1 – 2.7 $g.100g^{-1}$.



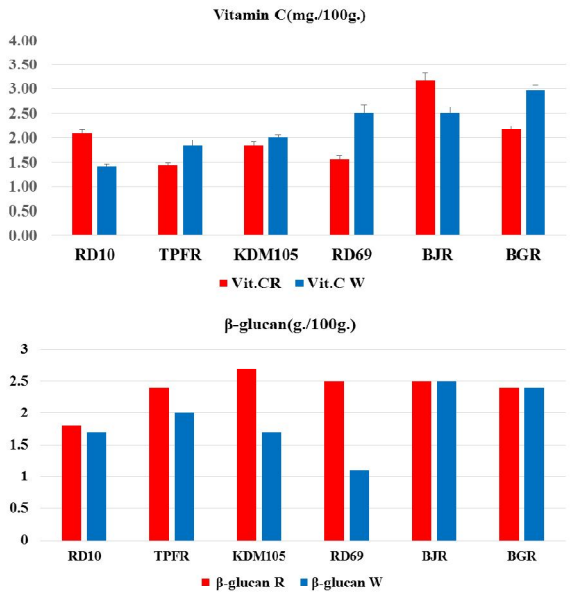


Figure. 2. The Beneficial health chemical composition 6 rice seedling under Red-light and White-light condition.

III. IMPACT HEALTH CHEMICAL COMPOSITION

Some substances in tea such as tannin and caffeine are restricted to people and ages.
(Table 1and Fig. 3).

A. Tannin Analyses

Tannins in seedling green tea was determine with the official [12]. method for tannins using Folin-Denis reagent.

Standard curve was built up by pipet tannic acid 100 $ml.L^{-1}$ 0, 0.5, 1, 2, 4, 8 and 10 ml. in volumetric flack. Filled with Folin-Denis reagent 5 ml. and saturated Sodium carbonate 10 ml. and adjust to 100 ml. with distill water in volumetric flack. Leave for 10 minute than transfer to measurement with UV/VIS spectrophotometer at λ762 to calculate the equation of tannin concentration.Weight 1 g. of seedling green tea sample in distill water 1:10 check 1 hour at room temperature and filtrate with Whatman No.1 and store in dark bottle. Carry out 1 ml. in 100 ml. volumetric flack and mix with 5 ml. Folin-Denis reagent. Adding saturate Sodium carbonate 10 ml. and adjust to 100 ml. with distill water in volumetric flack. Leave for 10 minute than transfer to measurement with UV/VIS spectrophotometer at λ762 to calculate the tannin concentration. The results have shown that TPFR green tea was the maximum tannin content with value of 2.78±0.02$mg.kg^{-1}$ under white light condition. The lowest tannin content was shown in BGR with the value of 0.045±0.01 $mg.kg^{-1}$ under white light condition. The range of tannin was 0.045±0.01 – 2.78±0.02 $mg.kg^{-1}$

B. Caffeine analyses

Caffeine was determine using UV-Vis Spectrometric method. Caffeine content in KDM105 seedling green tea was extracted by 1-propanol which is nontoxic and less expensive than chlorinated solvent, and then quantitative analyzed using UV-Vis Spectrometry at λ_{max}. The standard solution of 20 ppm. Caffeine in 1-propanol was scanned between 250-300 nm. and λ_{max}.was detect at 274 nm. At this λ_{max} the standard linear calibration curve of standard caffeine in 1-propanol in the range of 0-30 ppm. Was prepared and used to determine the amount of caffeine in rice seedling green tea. Caffeine highest content was detected in green tea of BJR (171.97±0.13 ppm.) at white light condition, and lowest in Khao Dawk Mali 105 (57.08±0.33 ppm.) at white light condition (Fig 3).A typical tea beverage, prepared in a proportion of 1 g leaf to 100 mL water in a 3-min brew, usually contains 250–350 mg tea solids, comprised of 30–42% catechins and 3–6% caffeine [13].

Table 1. Tannin and Caffeine content in 6 rice seedling under Red-light and White-light condition

Rice Leaf	Tannin Red	Tannin White	Caffeine Red	Caffeine White
RD10	1.936±0.035	1.363±0.00	10.94±0.25	11.29±0.88
TPFR	0.450±0.003	2.778±0.02	8.42±0.60	6.31±0.53
KDM105	0.191±0.021	0.137±0.02	7.15±0.00	5.71±0.33
RD69	0.861±0.003	0.834±0.00	7.50±0.12	6.69±0.24
BJR	1.363±0.005	1.892±0.03	8.42±0.18	17.20±1.30
BGR	1.860±0.004	0.045±0.01	7.10±0.62	6.37±0.70

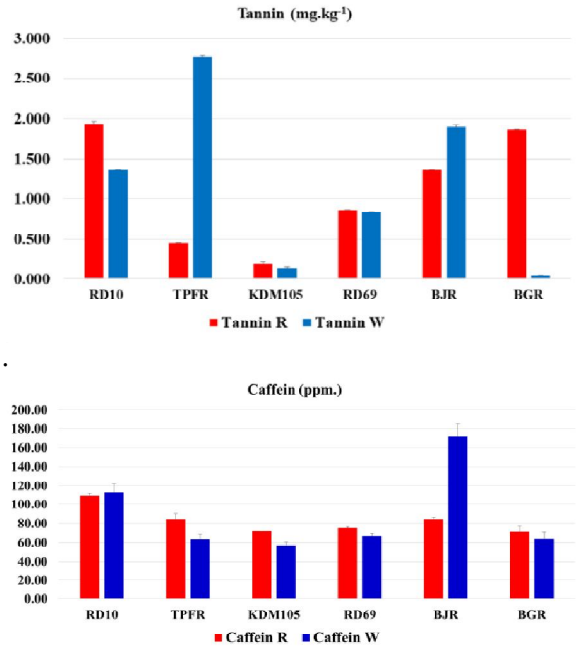


Figure 3. The Impact health chemical composition 6 rice seedling under Red-light and White-light condition

V. QUESTIONNAIRE OF SELECTIVE TEA BEVERAGE

Tea is the most consumed beverage after water in the world[14]. Many people prefer to drink tea daily. So the goal of this study was to assess the rice seedling

green tea with high content of essential elements in to the market. Khao Dawk Mali 105 green teaunder Red-light condition was selected with the high quality of %Dry weight, Biomass, β- glucan and low content of Tannin and Caffeine, and also have a good taste and smell. Khao Dawk Mali 105 green tea beverage, prepared in a proportion of 0.25 g leaf to 100 mL water in a 3-min brew, 201 persons were selected to drink trial this tea include of students, government officials, businessmen, housewives and private entrepreneurs. There were 22.8 percent coffee drinkers, 21.1 percent tea drinkers and 55.7 percent daily-drink. The results have shown that they were satisfactory in safe and useful of products(4.48±0.68). The score of 4.51±0.72 liked the smells and the most prominent features. (4.12±0.79and 4.05±0.89, respectively). It is unique in the packaging and could be become to market product of the value of 3.81±0.72

CONCLUSION

The influences of LED light quality to rice seedlings green tea grown in a semi-closed system have seem to be clear in the Biomass, consist of the beneficial health chemical composition and low content of the Impact health chemical. The Questionnaire was results that the selected tea Khao Dawk Mali 105 under Red-light condition,which was greater aroma taste and β-glucan (2.7 $g.100g^{-1}$.), with the lower content of tannin (0.191±0.02 $mg.Kg^{-1}$) and caffeine (71.5±0.00 ppm.) than others.Caffeine highest content was detected in green tea of Slovenian manufacturer (33.22 ppm.) [15]. So it could be become to market tea product. The light effect could be useful for the purpose of quality production.The LED light could be significance increase the protein, vitamin C and the antioxidant β-glucan and control low Tannin and Caffeine content. The further study is to more product in difference kind.

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