Value Addition on Refused Tea by Producing Bricks, Paper, Cardboards and Orchid pots

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ABSTRACT

Refused tea, a byproduct of tea production cycle, is a huge problems in tea sector. There is no method to dispose this byproduct from the factories as there is no use. In this study, an attempt was made to identify effective methods to remove refused tea through the production of new value added products. The investigation revealed that refused tea could be successfully used to produce bricks, paper and cardboards and orchid pots. This value addition would help to get rid of heaps of refused tea from the factories. It is a long term solution for daily accumulation of refused tea.

KEY WORDS: Refused tea, Accumulation, Extract, Foreign exchange

INTRODUCTION

Tea, *Camellia sinensis* (L). O. Kuntze is the major export agricultural crop in Sri Lanka. Annual production of tea is 308.1million kilograms, (Anon, 2004) and from which 95% is exported. Even though tea earns 682 million dollars (Anon, 2003), it occupies only 3% of the total extent of land in Sri Lanka.

The tea plantations are managed by government and private sector. The government sector consists of Janatha Estate Development Board (JEDB) and State Plantation Cooperation (SLSPC), while the private sector consists of management companies and tea small holders. The highest amount of made tea is produced by small holder sector followed by management companies. There are 23 management companies in Sri Lanka. Tea manufacturing is done at tea factories and most of them are owned by management companies.

The young shoot of the tea plant is the basic raw material for made tea and there are several steps in the tea manufacturing process. During tea plucking it is recommended to pluck bud with two/three leaves (Kathrivetpillei, 1986) to get better quality end product. However, it is difficult to practice and accidentally, some coarse leaves with fiber parts may be plucked. The fiber parts will give poor quality tea. In the tea manufacturing process unwanted tea stalks, fibers, too large and too small particles are extracted. These extracted parts amount to 3%-4% (Keegal, 1983) of the total production and accumulate in the factories as refused tea. Refused tea occupies a large space of the factory land and there are millions of tons of refused tea in the factory because it has no use. Small amounts of black tea can be extracted from refused tea by the process of winnowing (Dennis, 1990) and remaining part is called "Absolute Refused Tea". Refused tea and absolute refused tea have no value and according to the government rules and regulations they could not to be sold or reprocessed. Some producers mix refused tea with good tea, to maximize the profit. It could increase the profit of single a producer, but damages the image of Ceylon Tea. Daily storing of refused tea in factories results environmental and management problems.

With the increasing realization in developed countries of the ecological impact of the chemical industries, global heating, fast declining natural resources and deforestation *etc.*, the demand for environmentally safe products is rapidly increasing. Therefore, products made out of renewable raw materials such as plant fiber products have a good market potential, if they can be produced and sold at competitive prices.

Production of new, marketable products from refuse tea will help to obtain Hazard Analysis of Critical Control Point (HACCP) Certificate to the tea factories. Tea factories can also get International Standards Organization (ISO) certificates by removing these waste products carefully.

New products turned out from refused tea will bring additional income to the country and create new industries to Sri Lanka.

Therefore, there is an urgent need to identify methods to remove the refused tea with value addition. If there is an effective method to utilize this byproduct (refused tea), it could maximize the profit of the industry without damaging the image of Ceylon tea.

METHODOLOGY

This study was carried out at Somerset Estate managed by Thalawakelle Plantations Ltd. Refused tea was used as basic material to produce bricks, paper and cardboards, and orchid pots.

Refused tea bricks

Bricks were produced by using bricket machine which is used in coir dust brick production. The refused tea passed through a sieve with gauge 40 mesh to separate dust from stalks and fiber portion was then compressed under 3 ton force in a bricket machine. The bricks were covered with a shrinking polythene sack soon after compressing in the machine.

Market potential of the bricks was determined and the possible profit from the bricks was calculated.

Refused tea papers

Paper and cardboards were produced in Eliwila handmade paper company at Makandura. Dust stalks and the large fiber portion in refused tea were removed by a process of sieving through gauge 40 mesh, to extract the flexible fiber portion which was used in the manufacture of paper. The pulping agent was the recycled paper pulp, produced from recycled paper particles. It was ground and soaked in water for one day. Pulping agent was then mixed with flexible fiber portion and the mixture was beaten in a beater.

Different proportions of pulping agent and refused tea (flexible fibers) portions were used in the production of different grades of papers (Table 1)

Quality of the made paper was determined by analyzing the following characteristics.

a) Colour
b) Smell
c) Strength by comparing with ordinary half sheets

Table 1. Proportions of the refused tea paper pulp

Paper type grades	Pulping agent (Binding agent)	Refused tea (flexible fibers) potion
1	35%	65%
2	25%	75%
3	15%	85%
4	5%	95%

Refused tea pots

The refused tea was separated into stalks and large fiber particles by passing through gauge 40 mesh sieve. Separated portion consisting of stalk and large fiber particles was spread, as a layer of 0.5cm thickness, on a paper laid on the floor. Then, undiluted rubber latex mixed with small amount of conc.NH_3 (5M), to avoid coagulation, was sprayed on to the layer using a hand sprayer. On sun drying for 2-3 hours after the treatment with latex, a flexible mat was resulted. This mat was inserted to the pot shape mould which had been already heated to 60^{0}C and compressed. Soon after compressing, pot was removed. Too much pressure could result in damaged pots. Therefore, correct pressure (1.5kg) was applied when compressing.

RESULTS

Value addition to the refused tea in brick, paper and orchid pot production was estimated and presented in Tables 2, 3 and 4.

Orchid pot

Table 2. Cost and added value to the refused tea in orchid pot production

Cost factor	Cost
Refused tea	0.20
Rubber latex	1.75
labour	2.00
Waste and other	0.50
Cost of production	Rs. 4.45
Marketable price	.25$ = Rs.25/=
Added value to the refused tea	Rs.20.55

The brick

Table 3. cost and added value to the refused tea in brick production.

Cost factor	Cost
Price of refused tea	0~10.50 (per kilogram)
Transport cost	1.7875 (per 650g) / per brick
Loading and reloading cost	.0975 (per 650g) / per brick
Rental for bricket machine (Including electricity, labour, storing, post handling)	3.25 (per brick)
Refused tea processing Vibrating, separating	.45 (per brick)
Shrinking polythene (covering)	.35 (per brick)
Wastage	.20 (per brick)
Total cost of production per brick	
If price of refused tea = 0	5.955 ~ 6/=
Price of refused tea=6.75 (per 650g)	12.75
Shipping, loading, transporting, insurance cost and bulk packing cost	35.00 (per brick)
Total export cost	47.75/= (per brick)
Marketable price	.75$ = Rs. 75/=
Profit per brick	(75-47) = 28/= per brick
Added value to the refused tea	Rs. 28/= per 650g

Paper production

Table 4. Cost and added value to the refused tea in paper production

Cost factor	Cost
Pulping agent cost	1.20 per paper
Cost of refused tea	3.80 per paper
Tea processing (separating flexible fiber portion)	0 .45 per paper
Beating cost	2.45 per paper
Labour cost	8.40 per paper
Waste	0 .35 per paper
Cost of production	16.65 per paper
Marketable price	35.00
Added value to the refused tea	Rs.18.35

DISCUSSION

Sri Lanka had been exporting coir dust bricks for last 10 years. These bricks earn large amount of foreign exchange and popular mainly in Middle East and Israel. Importing countries use coir dust bricks to prepare growing media for plants. Pressing coir dust in to bricks helps to reduce 90% of its actual volume and fix shape, and also makes handling, loading, shipping and transporting easy.

At present the main drawback is the limited availability of coir dust and as a result the increased price.

This study shows that refused tea is a good substitute for coir dust and the substitute is available in abundance. After separation of dust from the refused tea, stalks and fiber portion give high quality bricks

similar to coir dust bricks. Weight of bricks ranged between 650g and 700g.

In addition to their use in preparing growing media, refused tea bricks can also be used to produce organic manure. Refused tea is a dusty form of plant parts, and could be converted to organic manure easily.

Refused tea use to produce bricks should have a moisture content below 10% since values above this can promote microbial growth. Bricks should be sterilized before being exported to prevent microbial attacks which make bricks useless. Contamination of refused tea can be completely overcome by good post process handling. In the last stage of the black tea production tea is fired at 225^{0}F (Denis, 1990). Thus, black tea including refused tea portion, is completely sterilized when it comes out of driers. After firing process, stalks and fibers are extracted. However after extracting refused tea, handling of refused tea is completely different when compared to the making of black tea intended for human consumption and therefore, refused tea gets contaminated. Contaminated refused tea should not to be used brick production.

Refused tea bricks can be further improved by mixing with coir dust and improved bricks can be used as a growing medium for plants. This growing medium has high organic matter content and plant nutrients. Therefore it is considered as a good quality growing medium. Thus, further research is needed to make refused tea bricks as a balanced source for both organic matter and plant nutrients. This could increase the profit per brick. Bricks made of refused tea can be successfully marketed in eco-friendly countries.

Papers and cardboards can be successfully produced by using flexible fiber portion of refused tea. These tea papers can be used as writing papers, special decorated papers, cardboards and can be used to produce greeting cards, visiting cards and pulp based products.

Tea papers can also be used in the preparation of tea containers, too, especially, in attracting the "organic tea" consumers, who are more concerned on natural products. Hence, the tea paper containers add a considerable value to the tea inside.

Colour and odour of the paper will vary according to the percentage of flexible fiber portion. Paper grade 1 having 65% flexible fiber portion resulted in whitish colour papers and was low in tea smell and the strength of paper was comparatively higher than 75%, 85%, 95% papers.

Tests showed that grade 2 tea papers made out of 25% binding agent and 75% flexible fiber portion of refused tea had the highest quality. Paper made out of 95% refused tea did not have sufficient strength and therefore considered as low quality.

In paper making attempt was made to use the maximum amount of refused tea, to maximize the utilization of refused tea. The recycled paper pulp and refused tea should be evenly mixed and mixture should be free of inert/ foreign matters such as used staple pins, stones *etc.* which are common in recycled paper pulp. Both, uneven mixing and inert material, resulted in damaged papers. The thickness of the paper varies according to the paper pulp portion Therefore, the amount of paper pulp in the mixture determines whether the product is a cardboard or paper.

Orchid pots produced from large stalks and fiber portions of the refused tea were porous structures. Some orchid species grow on organic matter and these species absorb moisture from the air. Porous pots help roots, to grow freely so that orchid roots can absorb moisture from the air. Refused tea is a product of plant parts and act as organic compound. The orchid pot is hundred percent degradable and therefore environmental friendly.

Sri Lanka can earn more foreign exchange by promoting these products and at the same time provide a solution to the problem of accumulating refused tea at factories. These refused tea products have high market potential and these are environmental friendly products.

CONCLUSIONS

Bricks, papers, cardboards and orchid pots can be successfully produced by using refused tea and could be sold at competitive prices. New products turned out from refused tea will bring additional income to the country and create new industries to Sri Lanka. It could maximize the profit of the industry without damaging the image of Ceylon tea.

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