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RESEARCH ARTICLE

RESEARCH ON IMPACTS OF CERTAIN TECHNICAL MEASURES ON SHAN TEA VARIETY IN THE ORIENTATION TO AFFORESTATION CULTIVATION, SUSTAINABLE CROPS AND ENVIRONMENTAL PROTECTION

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ABSTRACT

Vietnam has natural conditions suitable for the growth and development of tea plants. Tea production plays an important role in the structure of agricultural production and tea products are important export items. Growing shan tea in the form of forestation is a technique that is very suitable to the land conditions, labor and farming practices of ethnic minorities in the uplands. Out of seven cuttings at different time annually on: January 15; Fabruary 15; March 15; September 15; October 15; November 15; December 15, those of the last two (Nov. 15th and December 15th) brought the best productivity. Of 5 new seedling height standards respectively: seedlings of 20cm (± 5cm) high; of 30cm (± 5cm) high; of 40cm (± 5cm) high; of 50cm (± 5cm) high; and those of 60cm (± 5cm) high. The results showed that newly planted Shan tea seedling height reached 60cm ± 5 after 12 months, the root diameter reached 1.24cm; the number of grade 1 branches reached 13.6; Number of leaves / tree reached 216.6 leaves; and survival rate was 96.7% higher than control at 95% of confidence level.

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INTRODUCTION

Vietnam has natural conditions suitable for the growth and development of tea plants. Tea production plays an important role in the structure of agricultural production and tea products are important export items. Tea manufacturing which brings reliable and stable income plays an important role in the process of industrialization and modernization of agriculture in rural areas, especially rural agriculture in the mountainous midlands of northern Vietnam. Therefore, Vietnam has the policy of developing tea in both directions: Stabilizing the area and replacing old tea varieties with selected tea varieties, cultivating the tea fields by intensive farming techniques in association with new processing technology in order to produce safe and high quality tea to meet the market demand (Nguyen HuuKhai, 2005). Shan tea has been researched for a long time, which determined that Vietnam has been the largest tea grower in the world and confirmed the role of developing Shan tea for socio-economic development in mountainous areas in the north of Vietnam. A survey and assessment on the production situation had been conducted (Do Van Ngoc, 2006)

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Through researches on the quality of Shan tea products in some regions of BacKan province, it has indicated that tea products here has a natural aromatic scents, soothing taste, covered with a milky layer of "snow," and shiny, creating a natural beauty. Production of Shan tea in these highland areas gives us safe tea products. From raw materials, Shan tea can be processed into green tea, black tea, yellow tea, and Pu-erh tea which has high economic value. The advantage of Shan tea material is to create Pu-erh tea - a unique tea product with refreshing and herbal medicinal qualities. Planting Shan tea in these high mountains can also serve as a protection forest, contributing to the sustainable development of mountainous areas, creating jobs, poverty reduction for ethnic minorities here (Hong Dieu, 2004). Growing Shan tea in the form of afforestation is a technique that is very suitable to the land conditions, labor and farming practices of ethnic minorities in the uplands, which has been formed and can be developed in the long run. In order for the Shan tea area in high mountains to become a commodity production area, in addition to good seedling and appropriate propagation techniques, there should be cultivation techniques too form Shan tea swiddens. In order to do these, two stages should be considered: In the stage of seedlings, the soil quality and nutrients in it must be paid enough care so that tea plants can grow and compete with grasses and the vegetation cover so that they can rise above the

canopy of shrubs (over 80cm); in the stage of Shan tea tree growth and branching, creating canopy and the tea plant height is over 1.2m, care measures should be paid attention to. (Do Van Ngoc, 2006). Researches showed that some technical measures for Shan tea varieties in the mode of afforestation for protection of the ecological environment is particularly important and essential.

Objectives of the study

- To study the technical methods of cutting Shan tea shoots to create new young tea plants of appropriate size to serve production.
- To research on new cultivation techniques of Shan tea in the mode of afforestation, in order to develop the area of Shan tea in high mountains in a sustainable way.

MATERIALS AND METHODS

Study Materials- Research material is a population of Shan tea grown naturally and seeded, scattered in highland BacKan province.

Time, place of study

Study Period: 2013 - 2016
Study location: In BacKan province.

Study content

- Research to assess on the ability to cut shoots of the first Shan tea.
- Research on some technical measures to cut Shan tea shoots in high mountainous area of BacKan province.
- Research on some technical measures to grow Shan tea by afforestation method.

MATERIALS AND METHODS

Study some technical measures to cut Shan tea shoots and Determine the appropriate cutting time for Shan tea plants - The experiment consists of 7 Treatments, 3 replications, each formula of 1m2 with 200 containers arranged in a randomized complete block method.

Treatment 1: Planting the cuttings on September 15
Treatment 2: Planting the cuttings on October 15
Treatment 3: Planting the cuttings on November 15th
Treatment 4: Planting the cuttings on December 15
Treatment 5: Planting the cuttings on January 15
Treatment 6: Planting the cuttings on February 15
Treatment 7: Planting the cuttings on March 15

Research on new cultivation techniques of Shan tea by afforestation method

Study to determine the standard of new young tea plants suitable for being grown by afforestation.

The experiment included 5 Treatments, 3 replications, each treatment with 100 plants (500m2).

Treatment 1: Young plants of 20 cm high 5cm (control)
Treatment 2: Young plants of 30cm 5cm high
Treatment 3: Young plants of 40cm 5cm tall
Treatment 4: Young plants of 50cm 5cm
Treatment 5: Young plants of 60cm 5cm high

* Research and monitoring indicators

Plant height: Measure the tree from the ground to the highest point of the tops

Stem diameter: Measure 0.5 cm root collar

- Leave 1 Shoot Elevation : Measure from the ground to the first shoot
- The number of Level 1 shoots / tree: Count all the shoots from the stem
- Canopy width: Measure the widest place of the tea plant canopy
- Survival rate after planting: In each treatment 30 consecutive plants were monitored and after 3 months, 6 months, 9 months and 12 months of planting.

Data Processing Methods

Experiment data on the swiddens were handled by the IRRISTAT 4.0 biophysical statistical processing software on the computer. Other experiments using the least significant difference (LSD)

RESULTS AND DISCUSSION

The results of the study determined the time of cuttings suitable for Shan tea and the effects of planting time of the cuttings on the development rate of scar tissue and Shan tea roots. After the cuttings are planted, from the cuttings of tea shoots, a layer of scar tissue will be formed and from which the roots of the tea plant will grow. Scar tissue formation, the rooting of cuttings depends very much on climate factors. Watching the scar tissue production, and the roots of Shan tea cuttings in different seasons, we obtained the following results. After 20 days, Shan tea cuttings have not started to generate scar tissue, this showed that the generation of scar tissue of Shan tea cuttings when planting in the high mountains occurs later than that in the midland. After 20 days, there had been 23.3% to 40.0% of the cuttings that rooted. After 40 days, only 20.0% to 66.67% of the cuttings began to generate scar tissue. After 60 days, the generation rate of scar tissue in the research periods ranged from 66.67 to 96.67%, the perioeds with the highest rate of scar tissue generation were the October 15, November 15, December 15 and January 15 (all reached the scar generation rate of 90%).

After 60 days: rooting rate in the experimental periods varied from 0.00 to 20.00%, in which Fabruary and March 15cuttings had not rooted.

After 90 days: The rooting rate of cuttings in experimental periods varied from 26.67% to 66.67%, the lowest cuttings were the Fabruary and March 15 ones respectively, only reached 33.33% and 26.67% and the highest rate belonged to November and Decemver 15 cuttings.

After 120 days: The rooting rate of Shan tea cuttings in the experimental periods reached 60.0% to 86.67%, in which the highest rate were November and December 15 cuttings, reaching over 80 % of the cuttings that grew roots.

Table 1. Effects of cuttings time on the development rate of scar tissue and rooting

Cuttings date	Scar tissue (%)			Rooting rate (%)		
	After 20 days	After 40 days	After 60 days	After 60 days	After 90 days	After 120 days
15 September	0,00	40,00	86,67	6,67	50,00	66,67
15 October	0,00	46,67	90,00	6,67	46,67	73,33
15 November	0,00	66,67	96,67	20,00	66,67	86,67
15 December	0,00	60,00	90,00	13,33	60,00	80,00
15 January	0,00	46,67	90,00	3,33	46,67	73,33
15 February	0,00	33,33	86,67	0,00	33,33	60,00
15 March	0,00	20,00	66,67	0,00	26,67	53,53

Table 2. Effects of cuttings time on germination of Shan tea cuttings

Cuttings dates	Germination rate after planting (%)		
	60 days	90 days	120 days
15 September	9,00	41,67	64,67
15 October	12,33	44,33	70,67
15 November	23,67	68,33	85,33
15 December	15,00	57,67	78,00
15 January	11,67	44,67	71,33
15 February	8,67	41,33	67,67
15 March	5,00	27,33	60,00

Table 3. Impacts of the cuttings dates on the transplating

Cuttings dates	Plant height (cm)	Leaves/tree	Stem diameter (mm)	Level 1 roots (rooting)	Root length (cm)	Plant weight (g)	Transplantingrate (%)
15/9	26,63	9,20	4,15	4,5	12,72	16,20	53,3
15/10	26,12	9,00	4,55	5,3	13,18	16,24	58,0
15/11	27,16	9,60	4,60	5,9	13,72	17,10	73,0
15/12	27,62	9,70	4,60	5,7	12,92	17,17	66,0
15/1	26,53	9,50	4,55	5,7	12,16	16,85	60,2
15/2	26,70	8,90	4,30	5,1	13,00	16,55	56,4
15/3	26,80	9,10	4,25	5,3	13,25	16,75	47,1
CV%							3,7
$LSD_{.01}$							3,88
$LSD_{.05}$							5,44

Table 4. Effects of young tea plant height on newly planted Shan tea plant height

Unit: cm

Treaments	Post-plating time	
	12 months	Difference compared to planting
Treatment 1: Plant height: 20cm ± 5 (control)	44,8	24,8
Treatment 2: Plant height: 30cm ± 5	59,5	29,5
Treatment 3: Plant height: 40cm ± 5	75,0	35,0
Treatment 4: Plant height: 50cm ± 5	85,4	35,4
Treatment 5: Plant height: 60cm ± 5	94,7	34,7
CV (%)	4,7	10,7
$LSD_{.05}$	6,2	6,2

Table 2 showed that monitoring the germination process of Shan tea cuttings after cutting 60, 90 and 120 days and after planting, we obtained the following results. After 30 days planting: From 5.00% to 23.67% of of the cuttings germinated, late period cuttings such as those of 15/2, 15/3 had low rate of germination, fom 8.67% to 5.00% respectively. After 90 days planting: The rate of germination of tea cuttings reached respectively from 27.33% to 68.33%.

After 120 days planting: The rate of germination of Shan tea cuttings was from 60.00% to 85.33%, the highest rate belonged to those of periods of November and December 15. Compared with the scar tissue production and the rooting of Shan tea cuttings, we found that there was a close relation among scar tissue generation, rooting and germination. In the early periods (September and October 15) and the late perioeds (February and March 15) the process of scar tissue, rooting and germination were later than in the periods of November and December 15 (Table2).

Impacts of cuttings planting dates on some growth indicators and the rate of transplanting Planting dates has a great impact on the rate of transplating of Shan tea plants when cutting shoots, the rate of transplanting cuttings planting periods varies from 47.3% to 73.3%, reaching the highest on November 15 and December 15. The growth of stem, leaf, root and weight of the whole plant after 300 days of planting were also significantly different between the planting dates. The plant height varies from 26.12 cm to 27.62 cm. The root diameter varies from 4.15 cm to 4.60 cm. The number of roots fluctuates from 4.50 to 5.90 roots / tree and the whole tree weight ranges from 16.20 to 17.10 g / tree. From the above results, it was found that: In Shan tea cuttings dates in Bang Phuc, Shan tea cuttings produced scar tissue, rooted later than those in the midland. Scar tissue generation, rooting and germination in experiment periods differed, usually reaching the highest rate in those on November and December 15. That was the reason why on November and December 15, there was a high percentage of transplanting, reaching between 73.0% and

66.0% respectively. The late periods such as February and March 15 had low rate of rooting and germination (Table 3).3.2. Results of new planting technical measures to grow Shan tea in the form of afforestation Effects of young tea plant height on the growth of the new tea plant plantations by afforestation method. In high mountain areas with complex terrains and great afforestation demand, Tea planting by afforestation method is very important since local people have not had experience in tea production in a concentrated manner. Growing tea on the basis of afforestation both creates high-yielding tea forests and creating forests for regular harvesting, contributing to improving and enhancing the livelihoods of ethnic minority people in mountainous areas.

when using young plants of 40-50 cm high and of 60 cm high, the growth rate of height after 1 year is from 34.7 to 35.4 cm, 9.9cm to 10.6cm exactly higher than that in the control Treatment 1.At the period of 6 months after planting, although tea plants did not show strong stem diameter growth, there was a strong difference in treatments 3, 4, 5 compared to control Treatment 1 (Table 5). At the 12-month period following planting: The stem diameter of the tea plants in all treatments increased from 0.96 cm to 1.24 cm, higher than the control one, ranging from 0.1 cm to 0.38 cm. In general, the stem diameter of young tea plants grown on the swiddens was

Table 5. Effects of young plant height on stem diameter of newly planted Shan tea plants

Unit: cm

Treatments	Post-plating time	
	6 months	12 months
Treatmen 1: plant height: 20cm±5 (control)	0,51	0,86
Treatmen 2: plant height: 30cm ± 5	0,54	0,96
Treatmen 3: plant height: 40cm ± 5	0,61	1,08
Treatmen 4: plant height: 50cm ± 5	0,65	1,18
Treatmen 5: plant height: 60cm ± 5	0,71	1,24
CV (%)	3,68	4,48
$LSD_{.05}$	0,04	0,09

Table 6. Effects of young tea plants on the number of level 1 shoots on the plant

Unit: shoot

Treatments	Post-plating time	
	6 months	12 months
Treatmen 1 : plant height: 20cm ± 5 (control)	1,8	7,5
Treatmen 2: plant height: 30cm ± 5	1,9	8,5
Treatmen 3: plant height: 40cm ± 5	2,5	9,4
Treatmen 4: plant height: 50cm ± 5	3,3	10,5
Treatmen 5: plant height: 60cm ± 5	4,3	13,6
CV (%)	7,3	8,3
$LSD_{.05}$	0,4	1,5

Table 7. Effects of young tea plant height on the number of leaves on newly planted Shan tea swiddens

Unit: leaf

Treatments	Post-plating time	
	6 months	12 months
Treatmen 1 : plant height: 20cm ± 5 (control)	39,9	104,5
Treatmen 2: plant height: 30cm ± 5	51,8	129,7
Treatmen 3: plant height: 40cm ± 5	55,5	155,0
Treatmen 4: plant height: 50cm ± 5	64,6	185,0
Treatmen 5: plant height: 60cm ± 5	69,9	216,6
CV (%)	5,9	6,9
$LSD_{.05}$	6,1	19,9

Table 8. Effects of young plant height on survival rate of newly planted tea plants on the swiddens

Unit: %

Treaments	Post-planting time	
	6 months	12 months
Treatmen 1 : plant height: 20cm ± 5 (control)	84,7	81,3
Treatmen 2: plant height: 30cm ± 5	90,0	89,0
Treatmen 3: plant height: 40cm ± 5	91,3	91,0
Treatmen 4: plant height: 50cm ± 5	95,7	95,3
Treatmen 5: plant height: 60cm ± 5	97,0	96,7
CV (%)	3,2	3,8
$LSD_{.05}$	5,3	6,3

Plant height growth: 12 months after growing tea cuttings in the tea forests, the height varies from 44.8cm to 94.7cm, when compared to the initial height when first planted, new Shan tea plant height increased, fluctuating from 24.8cm to 34.7cm.The data showed that in Treatment 2, after 1 year of planting, the tea plants grow at an average height of 29.5 cm. However, there was no definite difference compared to the control treatment (the height increase of 24.8cm); In Treatment 3, 4, 5, proportional to the height of the ones when grown in the nursery.

Table 6 showed that, as in the 6-month period, at the 12-month post-growing period, plants in Treatment 2 had the number of level 1 shoots with no definite difference compared to the control treatment; those in Treatments 3, 5 had a higher number of shoots than the control treatment.

Effects of young Shan tea plant height on number of leaves / a Shan tea plant after planting:

- The number of leaves / tea plant in all the treatments increased with age and rose sharply in the period between 6 and 12 months.
- At 6-month period after planting: Experimental treatments showed significantly higher number of leaves / plant than control treatment, exactly from 11.9 leaves to 30 leaves / plant.
- At the 12-month post-planting period: There was a statistically significant difference in the number of leaves / plant and higher than that in the control treatment, definately from 25.2 to 112.1 leaves / plant in all treatments.

Thus, it is a fact that the higher the young tea plants are, the stronger their growth of the stem, shoots and leaves on the swiddens become and the more the coverage of the tea swidden goes up (Table 7).

Influence of young plants height on their survival rate

The density of tea plants on the post-planting swidden is one of the most important criteria for evaluating the quality of the tea swidden which directly affects the coverage of the tea swidden and, in particular, the cost of replanting and affecting the capacity ability of the tea plants in the future.

Study the effect of young plant height on the survival rate of post-growing tea plants on the swidden

The survival rate of the cuttings in the treatments decreased sharply in the post-planting period to 6 months and then got relatively stable at the 12-month period. This stability increased steadily and in accordance with the plant height standard until transplanted on the swiddens.

The results of the study are in line with the results of the tea and fruit tree development project (2002). The survival rates of cuttings in all treatments were higher than that of control one at both 6 and 12-month post-plating periods. After 12 months of planting, cuttings in all experimental treatments achieved survival rates from 89.0 to 96.7%.

Conclusions

Researches done on cuttings time and some technical measures on Shan tea cuttings showed the best cuttings were from November 15 to December 15 annually. After 12 months, newly planted Shan tea plant height reached 60cm ± 5; stem diameter reached 1.24cm; Number of leave 1 shoots reached 13.6; Number of leaves / plant reached 216.6 leaves; and Survival rate was 96.7% higher than that in the control treatment of 95% reliability level.

REFERENCES

Do Van Ngoc, 2006. "Shan tea plant in upland area, a crop of development advantage in the high mountain region of northern Vietnam", workshop on studying development of Shan tea, Vietnam Tea Association, Hanoi.

Duong Hong Dat, 2004. Tea plants - Measures to Improve Productivity and Product quality, Labor-Social Publishing House, Hanoi.

Le Doan Dien 2003. Improving quality and export value of cashew, tea and coffee in Vietnam, Labor and Social Publisher, Hanoi.

Nguyen HuuKhai 2005. Vietnamese Tea Plant - Export Competitiveness and Development, Labor and Social Publisher, Hanoi.

Tea and Fruit Development Project 2002. Techniques of Tea Growing, Caring and Processing, Agricultural Publishing House, Hanoi.

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