Natural Science Journal
(NSJ)

Evaluating the Growth and Development Ability of 5 Late Ripening Varieties of Coffee (Coffea Canephora Pierre) in Lam Dong – Vietnam.

Natural Science Journal
ISSN: 2957-9074 (Online)
Vol.5, Issue No.1, pp. 13 – 18, 2024
www.carijournals.org

Evaluating the Growth and Development Ability of 5 Late Ripening Varieties of Coffee (Coffea Canephora Pierre) in Lam Dong – Vietnam.

Ph.D. Tao Anh Khoi

https://orcid.org/0009-0008-7250-6920

Accepted: 16th Feb 2024 Received in Revised Form: 5th Mar 2024 Published: 19th Mar 2024

Abstract

Purpose: To improve the quality of Vietnamese coffee, many synchronous solutions are needed can solve problems such as: Technical, economic, management... In which, changing the varieties of coffee to suit current weather conditions has contributed significantly to improving yields and quality.

Methodology: Experiments and the comparison among 5 late ripening varieties of coffee was implemented in Lam Dong province (TR10; TR14; TR15; TR16; TR6) .The experiment was carried out RCBD with 5 treatments, and 3 replications and three replication. TR10, TR16, TR14, TR15 are suitable for the conditions of Bao Loc, Lam Dong.

Findings: The TR10, TR14, TR15 Robusta in the commercial stage have a yield of > 4 tons of core/ha, the yield between trees in the same line is quite uniform, the rate of R1 type seeds is > 99%, and there is no rust disease.

Unique Contributor to Theory, Policy and Practice: It is recommended that the authorities consider and allow large-scale trial production in some areas with suitable conditions in Lam Dong province

Keywords: *Robusta Coffee Clone, Ripe Coffee, Growth, Yields, Coffee Quality.*

I. INTRODUCTION

Vietnam is currently the country with the largest exported coffee area and output in the world with over 500,000 hectares and an annual output of 750,000 - 950,000 tons. (Doan, 1998) According to assessments of major coffee industries and the Exploration Department, Vietnam's coffee export turnover increased due to increased quantity and quality, which is the biggest challenge that the Vietnamese coffee industry faces. This is an issue that needs to be paid attention to in the context of the international economy.

Regarding goals, Vietnam's current production method still does not have many guide robusta regarding product quality. Most similar types of coffee in production are harvested at the same time and only last 1-2 months, along with excessive green harvesting methods causing great labor pressure. Dynamics and yard systems lead to low coffee quality. According to experts, changing the way of harvesting and processing coffee, not harvesting too many green and young coffee beans, and organizing picking for 2-3 hours per task will bring profits every year. about 100 million USD.

However, even though similar varieties have the same ripening time but do not provide service, they may encounter many obstacles due to adverse weather conditions each year such as prolonged rains, difficulties and disruptions in transportation. The attraction stage as well as the regime seriously affects the quality of coffee.

1: Ministry of Agriculture and Rural Development Vietnam, Bao Loc *College of Technology and Economics*

can solve problems such as: Technical, economic, management... In which, changing the structure of coffee to suit current weather conditions has contributed significantly to improving quality, yields to server coffee for export.

II. MATERIALS AND RESEARCH METHODS

2.1. Materials

Including 5 ripe Robusta coffee robusta selected from the Central Highlands Institute of Agriculture and Forestry Science and Technology. These are pure ripe coffee robusta, capable of improving yields and quality of ground coffee. Cloned coffee include: TR10; TR14; TR15; TR16; TR6 (control)

2.2. Experimental arrangement of methods and monitoring of indicators

Experimental arrangement method: experiment planted in 2018 at the experimental garden of Bao Loc College of Technology and Economics.

Planting density was 1,111 trees/ha, arranged in a completely randomized block design with 5 treatments and 3 replications. Each base plot has 18 trees, the base plot area is 162 m2.

- Monitor targets:

+ Growth indicators: trunk diameter (mm), tree height (m), number of basic branches, basic branch length, number of nodes on branches, trunk length, branch length.

+ Yield and molecular indicators include the ratio of young to core, weight of 100 core, the ratio of seeds to numbers 16 and 18

+ Evaluation of iron and steel in the field: all leaves after monitoring are evaluated and classified according to a 7-level scale. Monitoring indicators: rate of diseased trees (%), rate of diseased leaves (%).

III. DISCUSSION RESULTS

3.1. Standards for growth

Table 1: Growth status of 5 ripe coffee varieties 36 months after planting

Clones	diameter (cm)	Plant height (m)	Level branch	1Number of fruit-bearing branch	Number of fruit-bearing nodes	Number of fruit-bearing branches per node
TR16	6,1b	176,9a	22,8ab	25,3b	17,6ab	24,7ab
TR15	6,4ab	168,8b	28,3a	28,4a	16,9b	23,1b
TR14	6,8a	179,7a	22,1b	28,7a	22,9a	24,5a
TR10	6,0b	176,0a	23,1a	31,7a	18,1a	26,2a b
TR6	5,6 c	165,3c	20,1b	24,9b	15,6b	22,5b
CV %	*8,1(**)*	*7,3(**)*	*6,5(*)*	*10,2(**)*	*8,6 (*)*	*6,3(*)*

Note: (**): the difference between the treatments is very significant; (*): significant difference between treatments;

The ability of a coffee tree to grow well is one of the factors that determine the yields of a coffee tree. When a coffee tree has a solid canopy and strong first-level branches, it will help the tree grow well. and gives high harvest yield (Phan, 1996). Table 1 shows that after 36 months of planting, the growth ability of cloned Robusta robusta is very good. Root diameter varied on average from 5.6 to 6.8 cm and had a very statistically significant difference. The tree height and number of pairs of branches are highest in line TR14 with a height of 1,797 m and 28.3 pairs of branches. For the TR6 variety (control variety), the trunk diameter and low plant height were statistically significantly different from the cloned coffee robusta participating in the experiment. The number of pairs of fruit-bearing branches of the coffee robusta also varied from 24.9 to 31.7.

The control variety had the lowest number of pairs of fruit-bearing branches and had a significant difference with other robusta. The number of fruit-bearing nodes in the coffee robusta in the experiment also had a statistically significant difference, the number of fruit-bearing nodes ranged from 15.6 to 22.9 nodes.

3.2. **Yields of 5 cloned coffee robusta in Bao Loc - Lam Dong**

Table 2: Yield of 5 cloned coffee robusta through 2 seasons 2021-2023

CLONES	YEILDS (tonnes/ha/year)		
	2021	**2023**	**Average**
TR16	3,89c	4,84b	4,36b
TR14	4,11b	5,10a	4,6a
TR15	4,50ab	4,9b	4,7b
TR10	5,2a	5,0ab	5,1a
TR6	3,24c	4,1c	3,67c
CV(%)	11,2	9,4	6,1(*)

Note: (**): the difference between the treatments is very significant; (*): significant difference between treatments;

When the cloned coffee robusta grow and develop until the third year after planting, they will enter the production and business stage. At this stage, the coffee robusta will have stable yields (Hoang, 1999). After 2 harvests, the yields of the clones in table 3.2 was higher than the control line (TR6) and had a statistically significant difference. In which, the TR14 and TR10 robusta have quite high yields right from the 3rd year after planting, reaching 3.24 and 5.2 tons of core/ha. The average yield of 2 crops ranges from 3.67 to 5.1 tons of core/ha. From the experimental results, it shows that cloned robusta coffee robusta have quite promising yields when entering the business stage.

3.3. Ripening time of 5 clones in Bao Loc - Lam Dong

Determining the ripening time is also one of the factors to evaluate the variety's characteristics so that planting and harvesting can be arranged on a synchronous farming area in the farming unit. Although the care conditions are the same, the results of ripening and harvesting time of the robusta are different (Che, 2006). In terms of ripening time of the coffee robusta participating in the experiment, it shows that the TR16 and TR15 robusta ripen earlier than other coffee robusta. These two robusta have a time from flowering to harvest of 11 months.

and ripened earlier than the control line. The TR14 and TR10 clones (control coffee robusta) are almost harvested later and ripen from early January. These robusta have a flowering time until harvest of 12 months.

3.4. Evaluate the coffee quality of 5 clones

Table 3: Evaluation of green coffee quality of 5 cloned coffee robusta

Clones	Weight of 100 core (g)	Fresh/ core ratio	Percent of seeds on sieve 18 mm	of seeds on sieve 16mm
TR16	21,9c	4,8b	70,5a	93,4a
TR14	23,1ab	4,4ab	70,4a	96,7a
TR15	23,4ab	4,1a	71,2a	94,1a
TR10	23,5a	4,0c	80,4a	96,2a
TR6 (Đ/c)	17,6d	4,5ab	19,1b	76,5b
CV(%)	*4,2*	*4,5*	*9.1*	*6.3*

Note: (**): the difference between the treatments is very significant; (*): significant difference between treatments;

Weight of 100 core/bean, ratio of fresh core/fruit, ratio of beans on sieve 18-16 are indicators to evaluate the quality of coffee beans. A high weight per 100 core means that the seeds are large and firm, so the seeds will be of higher quality. The ratio of freshness to beans is affected by the time of harvesting as well as the thickness of the coffee cherries. If we harvest when the trees are ripe at the same time, the quality of coffee will be high and the ratio of freshness to beans will be low, besides Therefore, if the skin is too thick, the fresh/bean ratio will also reduce the bean yield, so a good coffee line will have a low fresh/bean ratio. Results in Table 4 show that the weight of 100 beans of the robusta coffee robusta in the experiment is very high and higher than the control line and there is a statistically significant difference. Robusta TR14, TR15, TR10 have a weight of 100 core > 23g. These are robusta with an ideal weight of 100 core and somewhat affect the quality of the late-ripening varieties due to their long dry matter accumulation time. The percentage of beans on floor 16 of the coffee robusta participating in the experiment reached > 90%. Meanwhile, the percentage of seeds on sieve 18 is also quite high, reaching 70.4 - 80.4%. The fresh/multiply ratio of robusta averages from 4.0 to 4.8; In which the TR16 line has the highest fresh/core ratio, leading to limited productivity.

IV. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

The clones grew quite well and had higher yields than the control robusta. Robusta TR10, TR16, TR14, TR15 are suitable for the conditions of Bao Loc, Lam Dong, the varieties have good growth and development ability and are quite uniform, with many spare branches. The seed size is larger than the control variety TR6. Of the four coffee robusta participating in the experiment, robusta TR15 and TR10 are the most suitable for the natural and farming conditions in Bao Loc - Lam Dong.

The TR10, TR14, TR15 robusta in the commercial stage have a yield of > 4 tons of core/ha, the yield between trees in the same line is quite uniform, the rate of R1 type seeds is > 99%, and there is no rust disease. 5 cloned coffee robusta participated in the experiment, which can save at least one round of irrigation water and reduce labor pressure as well as drying yards, are very suitable for the locality and can replace old coffee varieties (Robusta).

2. Recommendation

It is recommended that the authorities consider and allow large-scale trial production in some areas with suitable conditions in Lam Dong province

REFERENCES

1. Che Thi Da (2006), research on breeding technology and intensive farming techniques for robusta coffee. (Summary report of key ministerial-level topics for the period 2001-2005)

2. Che Thi Da (2016), Research on selecting and creating high quality Robusta coffee varieties for the Central Highlands. (Report summarizing the topic in the department, ministerial level 2011- 2015)

3. Doan Trieu Nhan (1998), Market situation and direction of coffee production and business in Vietnam, VINACAFE.

4. Nguyen Sy Nghi (1992), Coffee Growing, Agriculture Publishing House, Hanoi.

5. Phan Quoc Sung (1996), Coffee planting, care and processing techniques, Agriculture Publishing House, Ho Chi Minh City.

6. Hoang Thanh Tiem, Doan Trieu Nhan, Phan Quoc Sung (1999), Coffee trees in Vietnam, Agriculture Publishing House, Ho Chi Minh City.

7. Coste, R. (1992), Coffee - the plant and the product, Wageningen, the Neitherlands.

8. Wrigley, G. (1988), Planting material in coffee, Longman Singapore Publ, Ltd. pp. 165 - 200.

9. Van der Vossen H.A.M (2001), plant breeding & seed consultat venhuizen the Netherlands, Coffee Breeding Practices, PP.184- 197