EVALUATION OF DIFFERENT STRAINS OF COFFEE ARABICA IN THE HIGHLANDS

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ABSTRACT

The study was conducted at the Baguio National Crop Research and Development Center for three (3) consecutive years from February 2006 to December 2009, to identify the best strains of Arabica Coffee for registration to the National Seed Industry Council.

The Arabica Coffee strains tested are as follows namely: BRRT, BRRB, B-10T, BRRI ,Catura and IRRT. Except for Yellow Bourbon all the rest s of the strains initiated flowered in late March while earlier in late April.

Based from the result of the study BRRT strain produced significantly the biggest canopy diameter, highest member of cluster per branch and number of berries per cluster with means of 290cm, 8.88cm and 10.84 respectively. The later was closely followed by B-10T with 10.84 berries per cluster. Further BRRT had the shortest distance of clusters with an average mean of 3.38 cm.

All strains were observed to be moderately resistance against major insect pest and diseases. On yield of berries BRRT produced the highest weight with an average mean yield of 1,941.55gm followed by 1,840.25 and 1,208gms/tree from strains B-10T and Red Bourbon and BRRI, respectively. The lowest was from Yellow Bourbon with 358.32gms/tree. The highest yield from strain BRRT could be due to the closer distance between nodes producing more number of clusters hence heavier weight of berries were produced.

The average mean weight of coffee bean among the different Arabica Coffee strains ranged from 16-21 grams/seed. Bigger of coffee beans were obtained from strains BRRT, BRRB, B-10T, and ranging from 150-175. Smaller beans were derived from Yellow Bourbon ranging 200 to 210 coffee beans.

On cup quality, the flavor of yellow Bourbon was very much preferred by cup testers with an average mean of 6.87 followed by strain BRRT and B-10T with 6.85 and 5.86. In terms of bitterness, most testers preferred strain BRRB with an average mean of 6.77 followed by IRRT with 6.6. The least was from the strain B-10T with a mean 5.7. Likewise, the aroma of Yellow Bourbon was very much preferred with an average mean of 7.17 followed by strains BRRB 6.07. The lowest was IRRT with an average mean aroma of 5.66. The general acceptability test ranging from average mean of 5.44 to 6.81 which was equivalent to like moderately.

The highest average mean return on cash expense was obtained from strains BRRT with 990.50% followed by strain B-10T with an average mean of 676.70%. The lowest was Strain Yellow Bourbon with 53.62%.

RATIONALE

Coffee is one of the most important agricultural commodities in the world as well as the most prestigious beverage consumed. Although the general preference is still instant coffee, the ground and brew sector is growing. In 2004, Philippine coffee farms have an estimated total production of 22,000 against the annual demand of 55,000 tons. With the higher coffee price and strong demand for coffee beans, efforts are being undertaken to increase coffee production in the country.

Arabica coffee is found to grow favorably in the cool areas of the Cordillera region particularly in Benguet and Mountain Province. The crop requires soil that is rich in minerals with Ph of 4.5 to 5.5 and a soil depth of 1.5 meters. A well distributed rainfall of about 40 to 70 inches annually is ideal with peak wet seasons of high humidity, 7 hours of sunshine daily and plenty of mist and moderate wind flows.

Coffee is the major source of caffeine which suggests that consumption of coffee have beneficial effects. The presence of antioxidants has proven to help mitigate the chances of heart disease and cancer. A study by Leitzmann, 1999 confirmed that it is specifically coffee and not other beverages containing caffeine; results showed that those who regularly drink 2 cups of coffee a day had about a 30 – 40% reduction in risk of gallstone disease. Drinking coffee does not only help increase our energy alertness, but may also help to keep our liver healthy.

Today, the coffee industry is beset with many problems to dismay the various stakeholders especially the farmers. Among the major problems confronted by the industry are low volume of production, poor quality of coffee beans, low yield and income per hectare. Likewise, the farmers limited technical know-how on appropriate production technologies such as fertilization, pruning techniques and cropping systems among others.

Assessment of technologies utilized by farmers in coffee growing areas in Benguet and Mountain Province reveals that traditional technologies were mostly practiced (Verzola et al 2003).

However, the coffee industry faces a bright prospect. World consumption of coffee continues to increase. Experts predict that the level of consumption will follow population growth of 2.75% per year. Our domestic consumption is also increasing by as much as 2.25% per year.

The volume of production in Cordillera Region is very low about 850 kilograms of green beans/ha compared to 1,500 kilograms in Region XI (BAS, 1999). This is due to poor yielding varieties that are susceptible to insect pests and diseases, lack of certified varieties, selection of appropriate varieties for seed production for quality planting materials. Whereby, the ideal yield for coffee production should range from 1.5 MT to 4 MT/ha.

Through the years, several strains were already existing and established in the highlands of the Cordillera Region, but no certified varieties of Arabica Coffee are being cultivated by the farmers, hence this study.

OBJECTIVES

1. To evaluate and characterize the different strains/varieties of coffee Arabica.
2. To determine the best Arabica coffee strains for NSIC evaluation and registration.
3. To propagate planting materials for distribution to farmers and stakeholders

METHODOLOGY

Seven entries of introduced coffee Arabica previously planted in the experimental lot of Baguio National Crop Research and Development Center were used in the study. These were planted at a distance of 2 x 3 meters between hills and rows. They are about 56 years old and were rejuvenated three years ago. The seven strains were used as treatments replicated 3 times making use of the randomized complete block design. The evaluation was based on the descriptor's list recommended for coffee.

The treatments were as follows:

S^0 - Robusta (check)
S_1 - Caturra Brazil
S_2 - IRRT
S_3 - Yellow bourbon
S_4 - Baguio Red Bourbon
S_5 - B-10-T
S_6 - BRRI
S_7 - BRRT

The different cultural management practices for coffee production such as application of recommended fertilizer with rate, time and method, weeding, watering, and control of insect pests and diseases were employed to ensure optimum growth and development of the coffee trees.

Data gathered:

Agronomical Characteristics

a. Vegetative

1. Plant height (cm). The highest trunk was measured starting from ground level to the top of the trunk
2. Trunk girth (cm). This was done by measuring the trunk girth of the sample trees 5cm above the ground.
3. Canopy cover (cm). This was measured at the widest diameter of the stems and foliage.
4. Growth vigor, growth habit, tip shoot color and leaf shape. These parameters were based on the horticultural characteristics on the coffee descriptors list.

b. Reproductive Characteristics

1. Time of flowering and flower characteristics. Flowering period and characteristics were observed during the period of the study.
2. Number of cluster per branch. Clusters were counted per branch.
3. Number of berries per cluster. Berries were counted per cluster.
4. Cluster distance (cm). Distance was measured from node to node where cluster arises.

Rating indices in relation to age and number of fruiting branches:

Scale:	Description
1 – 3	Very few fruits
4 - 5	Few fruits on nearly all branches
6 – 7	Many fruits on all branches

c. Berry characteristics

1. Fruit weight (g). Twenty sample berries were selected at random and weighed individually using a sensitive balance.
2. Fruit length and width (cm). Length and width of berries were measured using a caliper.
3. Pulp thickness (mm). Thickness of pulp was also measured.
4. Fruit shape
5. Berry color } Determined using the descriptors list for coffee.

d. Incidence of insect pests and diseases. The major insect pests of coffee affecting the plants during the evaluation period were assessed monthly. It includes aphids, stem borer, berry borer and mealy bugs.

1. **Plant damage**. This was assessed by using the modified rating scale on leaf miner. (Leaf Miner Task Force, 1998).

Scale	Description
1	No Infestation
2	1 – 25% of plant infested
3	26 – 50% of plants infested
4	51 – 75% of plants infested
5	76 – 100% of plants infested

2. **Disease severity.** Diseases affecting the coffee plants such as coffee rust, anthracnose, berry rot and leaf blight except for Robusta which was noted to be susceptible to the different diseases observed since it was preferable to lowland conditions

Scale	Description
1	No Infection
2	1 – 25% of plant infected
3	26 – 50% of plant infected
4	51 – 75% of plant infected
5	76 – 100% of plant infected

e. Yield and green bean characteristic

a. Yield (g/tree). Yield per strain was taken by taking the total weight of clean dry coffee bean using a weighing balance.
b. Moisture content (%). Seed samples weighing 200 g were submitted to NSQCS for analysis.
3. Seed weight (g). Twenty (20) dried bean samples were selected at random and weighed. Weighing individually 20 dried beans. Mean of twenty sample dried beans were individually weighed for each strain of Arabica coffee.
4. Seed length and width (cm). Twenty (20) dried bean samples were used.
5. Seed thickness (cm). Twenty (20) dried bean samples were used.
6. Seed shape
7. Seed color } Determined using the descriptors list for coffee.
8. Seed size characterization – This was taken by weighing 25 grams per treatment and counting of bean per treatment using the following scale.

Scale Number of coffee bean	Description
150 - 175	Big
176 – 200	Medium
201 & above	Small

f. Cup quality. There were ten evaluators (male & female) invited to determine the cup quality using the Brazilian Method.

Cupping Procedure of Coffee:

1. Two teaspoons of lightly roasted coffee beans were coarsely grounded.
2. The grounded coffee is placed in a medium size cup of boiling water.
3. Then a teaspoon is used to break the surface froth, while the aroma is being inhaled.
4. The coffee is tested based on its bitterness, aroma, flavor and beverage taste value.
5. The coffee is not swallowed during the test period, it is spit out and the tester is required to wash his/her mouth before another strain is tested.

- General acceptability test was determined using the following rating scale:

1. Bitterness

Scale		Description
1 -3	Low	Disliked
4 – 6	Intermediate	Liked moderately
7 – 9	High	Liked very much

2. Aroma

Scale		Description
1 – 3	Low	Disliked
4 – 6	Intermediate	Liked moderately
7 – 9	High	Liked very much

3. Beverage test-value

Scale		Description
1 – 3	Bad	Disliked
4 – 6	Intermediate	Liked moderately
7 – 9	Good	Liked very much

RESULTS AND DISCUSSIONS

Evaluation and Characterization

Plant Height (cm)

Among the treatments the highest plant height was obtained from strain BRRI with 368.33 cm closely followed by strain Yellow Bourbon 361.66. Numerically, however the shortest was BRRB 282.66 Table 1). No significant differences were observed. This could be attributed to the upright growth habit as well as spreading type of growth that was observed on the tree characteristics.

Trunk Girth (cm)

Results showed that strain 6 – BRRI registered the highest mean of 8.43 cm while strain IRRT had the lowest mean with 3.0 cm.

Canopy Diameter (cm.)

Significant difference was noted on the canopy diameter among the Arabica coffee strains. Strain BRRT registered the widest, 290 cm which is comparable with strain Yellow Bourbon with 288.33 cm. The narrowest was obtained from Caturra Brazil with 190.00 cm

All of the strains as well as the check variety Robusta have reddish brown tip shoot color except for IRRT and Yellow Bourbon which had light to dark green. Regarding leaf shape, all the strains have elliptical while Robusta have narrow elliptical leaf shape.

Table 1. Growth and horticultural characteristics of the different Arabica Coffee strains

Treatments	Plant Ht.(cm)	Trunk Girth(cm)	Canopy Diameter(cm)	Growth Vigor	Growth Habit	Tip Shoot Color	Leaf Shape
So- Robusta	358.33	7.0	268.33^{ab}	Strong	Spreading	Reddish Brown	Narrow Elliptical
S_1 -Caturra Brazil	283.33	4.96	190.0^{c}	Medium	Spreading	Reddish Brown	Elliptical
S2- IRRT	330.00	3.0	223.33^{bc}	Medium	Spreading	Dark Green	Elliptical
S3 –Yellow Bourbon	361.66	6.46	288.33^{a}	Medium	Erect	Light Green	Elliptical
S4 – BRRB	281.66	5.833	216.66^{bc}	Medium	Erect	Reddish Brown	Elliptical
S5 – B10-T	328.33	5.167	243.33^{b}	Strong	Spreading	Reddish Brown	Elliptical
S6 – BRRI	368.33	8.43	271.66^{ab}	Strong	Spreading	Reddish Brown	Elliptical
S7 – BRRT	350.00	5.76	290.0^{a}	Strong	Spreading	Reddish Brown	Elliptical

Means followed by the same letter are not significantly different at 1% level

Horticultural Characteristics

Most of the Arabica coffee strains flowered in late March while Robusta and Yellow Bourbon initiated flowers in late April. Variety Robusta and strain IRRT, BRRB, B10T, BRRI and BRRT were observed to have profuse flowering characteristics while Caturra and Yellow Bourbon were noted to have light to medium flowering capacity.

Number of Clusters/branch

The highest number of clusters was registered from strain BRRT which was significant to BRRB with means of 8.88 and 8.13 respectively. (Table 2)

Number of Berries/Cluster

Variety Robusta significantly registered the highest number of berries per cluster with 27.16 followed by strains BRRT, IRRT, Baguio Red Bourbon and strain Yellow Bourbon with respective means of 10.84, 9.72, 9.59 and 6.07 respectively.

The prolific production of berries was observed on variety Robusta, but in terms of berry size, it was very small compared to the different Arabica strains.

Distance of Clusters (cm)

Significant differences were observed among treatments in terms of distance of clusters. Strain BRRT had the shortest with an average of 3.38 cm which was significantly different from Robusta, with 6.54 cm. Observation show that the shorter the distance between nodes, the more clusters produced hence producing the higher yield among the strains.

Berry Characteristics

The average fruit weight of the different coffee strains ranged from 17 to 22 grams per seed except for control variety Robusta which had the lowest wt. 15 grams per fruit.

The highest fruit length of 1.58 mm and fruit width of 1.37 mm as well as the pulp thickness of 1.30 mm was obtained from strain BRRT. On the other hand, the lowest was variety Robusta with length of 1.20 mm., width 1.12 mm and 1.0 mm pulp thickness. Regarding fruit shape, all the strains have ovate fruit shape while Robusta had ovovate fruit shape. Moreover, berry color of the strains is red except Yellow Bourbon which is yellow.

Table 2. Horticultural characteristics of the different Arabica coffee strains

Treatments	Time of Flowering	Flower Characteristics	No. of Cluster per Branch	No. of Berries per Cluster	Cluster Distance (cm)
So- Robusta	Late April	Profuse	6.27^{bc}	27.16^{a}	6.54^{a}
S_1 .Caturra Brazil	Late March	Medium	6.47^{bc}	7.45^{b}	3.87^{b}
S2- IRRT	Late March	Profuse	6.87^{bc}	9.72^{b}	3.86^{b}
S3 –Yellow Bourbon	Late April	Light	(lowest) 4.87^{a}	(last) 6.07^{b}	4.03^{b}
S4 – BRRB	Late March	Profuse	8.13^{ab}	9.07^{b}	4.16^{b}
S5 – B10-T	Late March	Profuse	7.53^{abc}	9.59^{b}	4.14^{b}
S6 – BRRI	Late March	Profuse	7.73^{abc}	7.44^{b}	4.09^{b}
S7 – BRRT	Late March	Profuse	8.13^{a}	10.84^{b}	3.38^{b}

Means followed by the same letter are not significantly different at 1% level DMRT

Table 3. Fruit or berry characteristics of the different Arabica coffee strains.

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Treatments	Berry Weight (gms.)	Length (mm)	Width (mm)	Pulp Thickness (mm)	Fruit Shape	Berry Color
So- Robusta	15	1.20	1.12	1.0	ovovate	Red violet
S_1 .Caturra Brazil	20	1.53	1.24	1.18	ovate	Red
S2- IRRT	18	1.45	1.20	1.10	ovate	Red
S3 –Yellow Bourbon	17	1.40	1.10	1.12	ovate	Yellow
S4 – BRRB	20	1.53	1.35	1.23	ovate	Red
S5 – B10-T	21	1.45	1.36	1.15	ovate	Red
S6 – BRRI	20	1.28	1.16	1.12	ovate	Red
S7 – BRRT	22	1.58	1.37	1.30	ovate	Red

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Means followed by the same in a column are not significantly different at 1% level DMRT

1 / Average of 20 ripe berries.

Yield

Yield data recorded in 2007 to 2009 showed that among the seven strains of Arabica Coffee evaluated significant differences in the yield of BRRT which was consistent registering the highest mean yield of 1,941.55 (g) per tree.

Strain B10-T registered a mean yield of 1810.25 (g) followed by Red Bourbon of 1,208.59, BRRI with corresponding mean yields of 1208 gms/tree. The lowest was from Yellow Bourbon with a mean of 358.32 (g) per tree.

II. Economic Analysis

A. Total cost of Production/hectare = PhP. 69,924.80

B. Gross Return

Treatments	Price of Coffee bean/kg	Average Production/ ha (kg)	Total
So- Robusta	180.00	1,894.69	341,044.20
S1- Caturra	180.00	1,344.70	242,046.00
S2- IRRI	180.00	1,279.14	230,245.20
S3- Yellow Bourbon	180.00	450.09	107,420.40
S4- BRRB	180.00	1,033.54	362,572.20
S5- B10-T	180.00	3,884.11	543,108.60
S6- BRRI	180.00	1,466.96	245,048.40
S7- BRRT	180.00	3,917.45	762,552.00

C. Net Income

Treatments	Price	Average Production	Total
So	341,044.20	69,924.60	271,119.40
S1	242,046.00	69,924.60	172,121.20
S2	230,245.20	69,924.60	160,320.4
S3	107,420.40	69,924.60	37,495.60
S4	362,572.20	69,924.60	69,923.80
S5	543,108.60	69,924.60	473,183.80
S6	245,048.40	69,924.60	175,123.6
S7	762,552.00	69,924.60	692,627.20

D. Return on Cash Expense

Treatments

So $\frac{271,119.40}{69,924.60} \times 100 = 387.70\ \%$

S1 $\frac{172,121.20}{69,924.60} \times 100 = 246.15\ \%$

S2 $\frac{160,320.40}{69,924.60} \times 100 = 229.27\ \%$

S3 $\frac{37,495.60}{69,924.60} \times 100 = 53.62\ \%$

S4 $\frac{69,923.80}{69,924.60} \times 100 = 100\ \%$

S5 $\frac{473,183.80}{69,924.60} \times 100 = 676.70\ \%$

S6 $\frac{175,123.60}{69,924.60} \times 100 = 250.40\ \%$

S7 $\frac{692,627.20}{69,924.60} \times 100 = 990.50\ \%$

Table 4. Average three year data on dry bean yield of the different strains of Arabica Coffee.

TREATMENTS	YEAR EVALUATED			MEAN (g)
	2007	2008	2009	
	Yield/Tree (g)	Yield/Tree (g)	Yield/Tree (g)	
So = Robusta	1100.0	1201.0[b]	1110.08[c]	1137.02
S_1 = Caturra	1160.0	614.0[c]	610.08[d]	794.69
S_2 = IRRI	630.0	746.60[c]	926.67[c]	767.75
S_3 = Yellow Bourbon	270.0	298.30[d]	506.67[d]	358.32
S_4 = Red Bourbon	620.0	714.10[c]	2291.67[ab]	1208.59
S_5 = B10-T	2330.0	1564.10[b]	1536.67[b]	1810.25
S_6 = BRRI	880.0	764.33[c]	806.67[cd]	817.0
S_7 = BRRT	2350.0	214.66[a]	3260.00[a]	1941.55

*Means followed by the same letter in a column are not significantly different at 1% DMRT

Dry bean yield and bean characteristics of the different strains

The weight of the different Arabica coffee beans ranged from 16 – 21 grams per seed except for the control variety, Robusta which had the lowest weight of 14 grams per seed. Arabica beans are oblong in shape and purple brown in color while Robusta is ovate.

As to the size classification of the dried coffee beans, BRRT, BRRI, BRRB and Catura were classified as larger in size while Yellow Bourbon and Robusta obtained smaller size of coffee beans. All the strains are uniform in thickness except for Robusta with .27 mm. The highest seed length, width and thickness was obtained from strain BRRT and the lowest was registered from Robusta.

Results showed that all seed samples of coffee strains passed the standard moisture content ranging from 12.6 to 14.00. The samples were analyzed by the National Quality Control Laboratory based at BPI Compound, Baguio City.

Table 5. Bean characteristics of the different strains of Arabica coffee1 /

Treatments	Dry Seed Wt. (g)	Moisture Content (%)	Seed Length (mm)	Seed Width (mm)	Seed Thickness (mm)	Seed Shape	Seed Color
So- Robusta	14	14.9	.70	.51	.27	ovovate	Yellow
S_1 .Caturra Brazil	19	13.7	1.00	.80	.30	oblong	Brown Purple
S2- IRRT	17	14.1	1.10	.82	.30	oblong	Brown Purple
S3 –Yellow Bourbon	16	13.8	1.02	.78	.25	oblong	Brown Purple
S4 –BRRB	19	13.4	1.12	.83	.30	oblong	Brown Purple
S5 –B10-T	20	12.6	1.10	.82	.30	oblong	Brown Purple
S6 – BRRI	19	12.6	1.16	.85	.30	oblong	Brown Purple
S7 –BRRT	21	13.3	1.20	.86	.30	oblong	Brown Purple

* Means followed by the same letter in a column are not significantly different at 1% DMRT.
1 / Average of 20 dried Coffee Arabica beans.

Incidence of Major Insect Pests & Diseases

Insect pests such as aphids, mealy bugs, berry borer and stem borer were observed during the plant growth. The monthly assessment of insect pests population ranged from 2.0 to 3.0 equivalent to 1-25% and 26-50% infestation. This could be attributed to effective insecticides and fungicides that were sprayed which was done once in two months.

For the disease incidence, coffee rust and anthracnose it has a registered rating ranging from 2.0 to 3.33 which is resistant; equivalent to 26 – 50% infection. Likewise, berry rot and leaf blight infection registered a rating ranging from 2.0 to 3.33 which is resistant; except for Robusta

variety which is equivalent to susceptible to the different diseases observed with a rating of 3.66 which is expected since this variety prefers lowland condition.

Table 6.1 Incidence of major insect pests

Treatments	Aphids	Mealy Bugs	Berry Borer	Mealy Bugs
SO	3.0[a]	2.33[a]	3.0	3.0
S1	2.0[a]	2.33[a]	2.33	3.0
S2	2.0[a]	2.33[a]	2.33	2.66
S3	2.0[a]	2.33[a]	2.66	3.0
S4	2.33[a]	2.00[a]	2.66	2.33
S5	2.33[a]	2.33[a]	3.00	2.33
S6	2.0[a]	2.33[a]	3.00	2.33
S7	2.0[a]	2.33[a]	2.66	2.0

* Means followed by the same letter in a column are not significantly different at 1% DMRT.

Table 6.2 Incidence of major diseases

Treatments	Coffee Rust	Anthracnose	Berry Rot	Leaf Blight
SO	3.66	3.66	3.66	3.5
S1	3.33	3.33	3.00	3.33
S2	3.33	2.50	2.00	3.33
S3	3.33	2.50	3.00	2.50
S4	3.33	2.50	3.00	2.50
S5	3.00	3.00	2.00	2.33
S6	3.00	2.66	3.00	2.00
S7	3.00	2.66	2.00	2.00

Cup Quality

The cup quality of the different strains of Arabica coffee was determined by inviting 15 cup testers using the Brazilian Method. No significant difference was observed for the cup quality test conducted. In terms of flavor, S_3 (Yellow Bourbon) got the highest mean of 6.90 followed by S_4 (Red Bourbon) with an average mean of 6.85 and the lowest was So (Robusta) with a rate of 5.41. Likewise, The aroma of Yellow Bourbon was very much preferred by the cup testers having an average mean of 7.17 followed by S4 – 6.07, S6 – 6.03, S7 – 5.91, S5 – 5.87, S2 – 5.88, S1 – 5.66, So – 5.05 in that order.

On the other hand, the beverage test-value strain Red Bourbon was liked very much by the cup testers with a mean rating of 6.81 followed by S1 (Caturra) with 6.66, S7 (BRRT) with 6.2 and the lowest was S2 (IRRT) with 5.44.

Table 7. Average Three-Year data on cup quality of the different strains of Arabica Coffee.

Treatments	Flavor			Average	Bitterness			Average
	2007	2008	2009		2007	2008	2009	
S_O	6.2	4.67	5.41[b]	5.42	7.60	6.0	7.6[a]	7.06
S_1	6.2	7.0	5.40[b]	6.20	7.20	6.50	6.10[b]	6.6
S_2	6.10	6.0	5.87[a]	5.99	7.40	5.33	6.30[b]	6.3
S_3	6.50	7.33	6.87[a]	6.9	5.10	7.0	6.70[b]	6.27
S_4	7.20	6.67	6.70[a]	6.85	7.50	6.33	6.50[b]	6.77
S_5	6.10	4.67	6.82[a]	5.86	5.80	5.0	6.35[b]	5.7
S_6	6.40	5.33	6.35[a]	6.02	4.80	7.30	6.45[b]	6.18
S_7	6.30	5.67	6.85[a]	6.27	5.30	6.50	6.87[b]	6.22

* Means followed by the same letter in a column are not significantly different at 1% DMRT.

Table 7.1 Average Three-Year data on cup quality of the different strains of Arabica Coffee.

Treatments	Aroma			Average	General Acceptability Test			Average
	2007	2008	2009		2007	2008	2009	
S_O	5.10	5.0	5.05	5.05	5.50	5.33	6.1	5.64
S_1	6.20	5.0	5.80ab	5.66	6.70	7.0	6.3	6.66
S_2	5.90	6.67	5.05b	5.87	4.80	5.33	6.2	5.44
S_3	7.70	6.67	7.15a	7.17	5.10	6.67	6.4	6.05
S_4	5.50	6.67	6.05ab	6.07	6.90	7.33	6.2	6.81
S_5	4.90	6.0	6.75b	5.88	4.90	5.67	6.3	5.62
S_6	4.20	8.0	5.90ab	6.03	5.60	6.33	6.4	6.11
S_7	5.00	6.17	6.57b	5.91	6.20	6.0	6.4	6.2

* Means followed by the same letter in a column are not significantly different at 1% DMRT.

High	9 = 8 = 7 =	Liked very much
Intermediate	6 = 5 = 4 =	Liked moderately
Low	3 = 2 = 1 =	Liked slightly

Table 8. Production and distribution of Registered Arabica Coffee Strain

Treatments /Strains	Production		Distribution	
	2009	2010	2009	2010 (Jan-June)
Catura	600	3000	-	-
Yellow Bourbon	-	3000	-	-
Red Bourbon	2000	6000	750	-

Table 8.1 Not Registered Coffee Production and Distribution

Production		Distribution	
2009	2010	2009	2010
10,000	10,000	8,453	1,154

Meteorological Data

The average maximum temperature recorded in 2009 was 21.5 ºC and the minimum of 15.1 ºC. The lowest maximum of 22.1 ºC was recorded in June while the minimum temperature of 12.9 ºC was recorded both in January and December. The average relative humidity for the year of 2009 was 86.5%. A total of 4,355.58 mm of rain was recorded in 2009, while the highest rainfall was noted in October with a total of 1,981.8 mm. This meteorological data was gathered by the Weather Bureau of Baguio City

Table 9. Meteorological Data

Year	Temperature ºC		Relative Humidity%	Total Rainfall (mm)
	Maximum	Minimum		
2009	21.5	15.1	86.5	4,355.58

CONCLUSION

The study was conducted at the Baguio National Crop Research and Development Center from 2006 – 2009, to evaluate and characterize the different strains of Arabica coffee, to identify the best strains for National seed Industry Council Registration and to propagate planting materials for distribution to farmers and target clienteles.

Results showed that out of seven strains the highest plant height was from BRRI with 368.33 cm. followed by Yellow Bourbon with 361.66. Significant differences was noted on canopy diameter for strain BRRI registering the widest with 290cm which was comparable with Yellow Bourbon with 288.33 cm while the narrowest was obtained from Caturra Brazil with 190.00cm.

On the number of cluster per branch, strain BRRT registered the highest with 8.88 and BRRB with 8.13. Regarding the number of berries per cluster check variety Robusta got the highest with 27.16 followed by strain BRRT, IRRT, BRRB, BRRI with respective means of 10.84, 9.72, 9.59 and 6.07. Significant differences were also observed among treatments in terms of distance of clusters. Strain BRRT had the shortest with 3.38cm. Result indicated that the shorter the distance between nodes, the more clusters produced the higher yield..

In terms of yield, significant differences were noted among the strains. Strain BRRT produced the highest weight of 3,200 grams/tree which differed significantly from other strains. Findings could be attributed to the fact that it has the highest number of clusters per branch, shortest distance of internodes as well as the number of berries per cluster.

From the evaluation study on Arabica coffee different strains, Strain 7 (BRRT) has higher (ROCE) of 1,535.80% followed by Strain 5 (B10T) of 1,065.05%. This was due to the highest yield produced with an average yield of 4.2 metric tons/hectare. Further BRRT registered the shortest distance of clusters between nodes, highest number of cluster per branch as well as the greater number of berries with 10.84.

All of the strains were moderately resistant to the incidence of insect pests and diseases. As to the beans size, all of the strains were classified as bigger in size except for Yellow Bourbon which registered smaller size of coffee beans. On cup quality, the flavor of Yellow Bourbon was very much preferred by the cup testers with an average mean of 7.33 followed by Caturra with a mean of 7.0 while the rest of the strains were moderately liked by the cuppers. On the otherhand, the aroma of strain BRRI was liked very much by the panelist with a rating of 8.0 followed by strains BRRB, BRRI and Caturra with the same rating of 6.67.

RECOMMENDATION

Based on yield, BRRT, BRRB and B10T are recommended for their high yielding strain production and moderately resistant to pests and diseases incidence.

On cup quality, the flavor of Yellow Bourbon is recommended which was very much preferred by the Panelists. Likewise, the aroma of BRRI, BRRB, BRRT and Caturra are also recommended which was liked very much by the coffee cuppers

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