

Screening of a local “HABANERO” Chilli variety (NAI MIRIS) for the export market in Sri Lanka

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ABSTRACT

Chilli is an important food ingredient in many parts of the world. Chilli varieties found in Sri Lanka with distinguished traditional values are not scientifically screened yet even though it is vital to explore them to the export market. Hence this study was conducted to identify a suitable variety of Nai miris among the locally available varieties based on their vegetative and reproductive characters for the export market. Therefore a study was planned to phenotypic and yield characters of local habanero chilli varieties available in Sri Lanka. This study was conducted at the Dodongolla Agriculture Experiment Station, Kandy. Eight different locally unnamed varieties of Nai miris were collected from the export oriented chilli cultivation field in the up-country region of Sri Lanka. The unnamed varieties were named as A to H. Different qualitative and quantitative characters such as plant height, mature leaf area, canopy width, days for flowering, single fruit weight, mature fruit colour, unripe fruit colour, fruit size, fruit shape and fruit surface appearance were evaluated. Randomized complete block design was used to set the experimental plots and the Minitab software was used to analyze the data. Significant difference was observed at ($p < 0.05$) with 95% Confidence interval among unnamed varieties in quantitative characters. Among the qualitative characters significant differences were observed. But immature fruit colour did not show any significant difference among varieties. Varieties named as **F** and **A** showed better performance among the eight groups studied. However, variety **F** showed superior field performance among all varieties. This study found eight unnamed varieties of Habanero “Naimiris” which occurred in Sri Lanka. Further, Variety **F** showed better qualitative and quantitative performance out of the eight varieties studied. Variety named as **A** played second best compared to other varieties. The result also implied that there was a positive correlation between the chilli pod size and phenotypic characters such as plant height, single fruit weight and days for flowering.

Keywords: Habanero, Naimiris chilli, unnamed varieties, qualitative, quantitative characters

INTRODUCTION

Chili (*Capsicum* sp.) is an important spice and vegetable crop coming under the family Solanaceae, which was originated from South and Central America (Darshan *et. al.*, 2016). It is a demanding crop which is

extensively cultivated in tropical Asia and equatorial America with a high amount of genetic diversity for its edible and pungent fruit with nutritional values (Colney *et. al*, 2018).Yield and yield-related characters in chili have been widely documented and have been improved by heterosis breeding (Rohini *et. al*, 2016. Also,(IBPGR, 2017)stated that chili is the second most important crop among the Solanaceae crop. Considering the nutritive values of Solanacea crops, chili is by far superior to both tomato and egg plant in Vitamin A& C content. People use chili in a day to day food as it is a rich source of vitamin, assists in digestion, give pungency& color to the dishes and it is also has a medicinal value in preventing heart problems. However, it is cultivated in a small part of the land area in the world which is estimated to be approximately 0.96 Million ha. The majority of capsicum is planted in the developing tropical and sub-tropical countries.

In Sri Lanka chili research activities were at its peak in 1960's and in the early 1970's at the Agriculture, research station in Mahailupallama. As a result, the annual production of chili was greatly increased. In 2018, it was around 79, 000 MT. from 13, 553 ha. In 1980. In the same year about 82,000 kg of fresh capsicum was exported to foreign markets, which worth Rs 32 million export earnings (AgStat, 2019).Among the five commonly cultivated capsicum species of World, *Capsicum annum* and *Capsicum frutescens*. L are the major species grown in Sri Lanka.

Up to now, over one hundred genera are identified and many botanical varieties are identified including twenty wild species. According to(Wijesinghe,1994)*Nai miris* is recognized under *Capsicum frutescens*(2n=24)which is a soft stemmed perennial shrub having a well-developed tap root system, leaves are thin, unequal in shape, oval or oblong with acute apex. Flowers are small and grouped, pedicels erect at anthesis but flowers nodding Corolla greenish-white without diffuse spots at base of lobes, corolla lobes often slightly revolute. Calyx of mature fruit without annular constriction at junction with pedicel, through often irregular wrinkled. Fruit flesh often soft. Seeds are straw coloured.

Objectives:

01. To evaluate the phenotypic and yield characters of local habanero chilli varieties available in Sri Lanka.
02. To screen a local habanero chilli variety suitable for export market based on the phenotypic and yield characters studied.

MATERIALS AND METHODS

Location:

The experiment was carried out at Dodongalla agriculture experimental station which is attached to the Faculty of agriculture, University of Peradeniya, Sri Lanka. The station is situated in the Agro ecological zone categorized as IM3 of Sri Lanka (Crop technology,2015).The site is a flat up land, which received full sunlight during whole day hours. The soil was found to be light textured, well drained reddish-brown loamy soil. The average rain fall and temperature were recorded as 1250mm and 24-28°C respectively (Irshath and Jesfar, 2021).

Well ripened Naimiris fruits belonging to different unnamed varieties were collected from the export-oriented chili cultivation field in the up-country region of Sri Lanka. The fruits were subjected to a qualitative and quantitative shortening. The pod colour, shape and size were used to sort the pods. Eight distinctive groups of Naimiris pods were identified based on the above sorting and the groups named as A, B, C, D, E, F, G and H (Figure 1). Seeds were extracted from the pods and dried separately under direct sunlight. The dried seed sample was treated with fungicide and allowed to germinate in trays under plant house. Six weeks old seedlings were planted in 1.3mX 3m size pots. Four replicates for each group were maintained. One deep plough and two harrowing were practiced to have a fine tith of soil, the stone, sticks and stumps were removed from the beds to prepare with smooth surface for seedling (Jesfar *et. al*, 2018). The agronomic practices such as nursery establishment, nursery management, land preparation, pest and disease management were carried out based on the recommendation made by the Department of Agriculture, Sri Lanka in (Crop guide, 2016).The plants were managed homogeneously and evaluated separately.

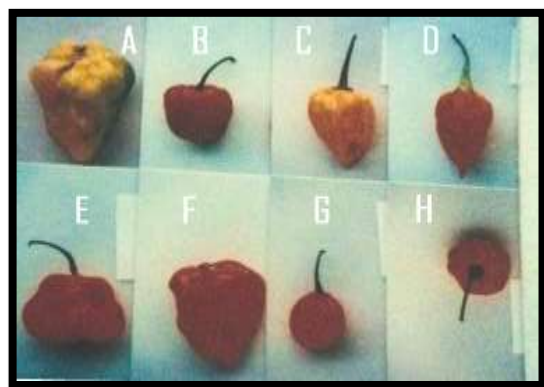


Figure 1. Unnamed “Naimiris” varieties used for the study.

The experimental design was Complete Randomized Block Design (CRBD) used with four replicates for each group of Naimiris. Therefore, a total number of $8 \times 4 = 32$ uniform plots were managed. Random sampling technique was used to collect the data on plant height, mature leaf area, plant canopy width, days for flowering, single fruit weight, matured fruit colour, fruit size, fruit shape and fruit surface appearance. Four replicates were used for each Variety.

RESULTS AND DISCUSSION

Table 01 shows, the mean value of average plant height (APLH), average single leaf area (ASLA), average plant canopy width (APCW) average days for flowering (ADFF) average Days for flowering (ADFF) and average single fruit weight (ASFW). The following results were described based on table 01.

Table 1.The mean values of quantitative and qualitative chilli characters.

Mean values of characters	Chilli varieties						
	A	B	C	D	F	G	H
APLH	27±0.01	22.75±0.02	31.75±0.03	26.6±0.05	29.6±0.01	29.1±0.01	26.1±0.01

ASLA	112.3±0.01	68.6±0.01	105.13±0.01	108.10±0.01	108.3±0.01	84.2±0.02	71.4±0.01
APCW	30.8±0.02	26.2±0.02	30.4±0.01	26.8±0.01	30.5±0.01	29.9±0.02	27.5±0.01
ADFF	53.06±0.00	45.5±0.00	48.6±0.01	63.57±0.01	54.28±0.01	70.6±0.01	65.13±0.01
ASFW	8.56±0.01	7.06±0.01	6.8±0.01	6.75±0.05	8.40±0.02	3.01±0.00	2.78±0.02

Values are mean ± SD; Sample (n) = 4. **APLH**-Average plant height, **ASLA**-Average single leaf area, **APCW**-Average plant canopy width, **ADTF** – Average day to flowering **ASFW**- Average single fruit weight.

Average plant height (APLH): Average plant height showed significant variation ($p < 0.05$) among different unnamed varieties (Figure 2). The highest mean plant height was observed in group E (33.12 cm) and the least was 22.75 cm observed in group B. The population mean was 28.2cm (Table 1). The results revealed that varieties C and E were the tall plants among tested groups, whereas group A, B and D showed lower plant heights in a descending order among the tested varieties.

Average single leaf area (ASLA): There was a high variation and significant differences observed in Average single leaf area among groups A, B, G and H. Further, a slight variation was observed among group C, D, E and F (Figure 2). Group A showed higher average single leaf area and B played lowest record which were 112.3 cm and 68.6 cm respectively. Other groups showed in between the above values in single leaf area and the population mean was of 95.16 cm (Table 1). Based on the analysis, varieties A, F and D addressed superior character in average single leaf area.

Average plant canopy width (APCW): All groups of Naimiris showed significant difference in average plant canopy width ($p < 0.05$) (Table 1). Plant group E expressed best canopy record than other groups. Groups B, D and H recorded the least and almost same average plant canopy widths than groups A, C, F and G (Figure 1). Further highest (36.6 cm) and lowest (26.2 cm) canopy width were observed in group E and B respectively.

Average days for flowering (ADFF): All groups of Naimiris showed significant variation in days for flowering. Higher variations were observed among group B, C and E when compared with groups G & H. Also, Group A and F showed medium variation when compared with group G and H, whereas Group B and E showed least record in Average days for flowering. Comparatively group G, H and D expressed late flowering characters and recorded as respectively as 70.6, 65.13 and 63.57 days for flowering, while group B and E showed early flowering characteristics which were 45.5 and 44.3 days respectively (Figure 2). Also group A and F took medium number of days (53-54 days) for the flowering from the date of transplanting (Table 1).

Average single fruit weight (ASFW): All group of plats showed significant differences in average single fruit weight ($p < 0.05$). High variation was observed among groups A, B, G and H (Figure5). Group B, C, D and E showed almost least variation among the group. Higher average single fruit weight (8.56 g and 8.4 g) were observed in group A and F respectively whereas the lower average fruit weights (3.01 and 2.78 g) were recorded in group G and H.

The qualitative characters were categorized in table 2 & table 3 and groups were selected accordingly. Variety A and F expressed advanced vegetative and reproductive characters such as ASLA, ADTF and ASFW even though Variety A is poor in APLH and medium in APCW whereas variety F is moderate on these two

parameters studied. Other varieties studied such as B, C, D, E and G showed vulnerable vegetative and reproductive characters such as PLHA, ASLA, APCW, ADTF and ASWF, while C showed advance trait in APLH, whereas variety E showed good APCW as a qualitative character (Table 2 and Figure 2).

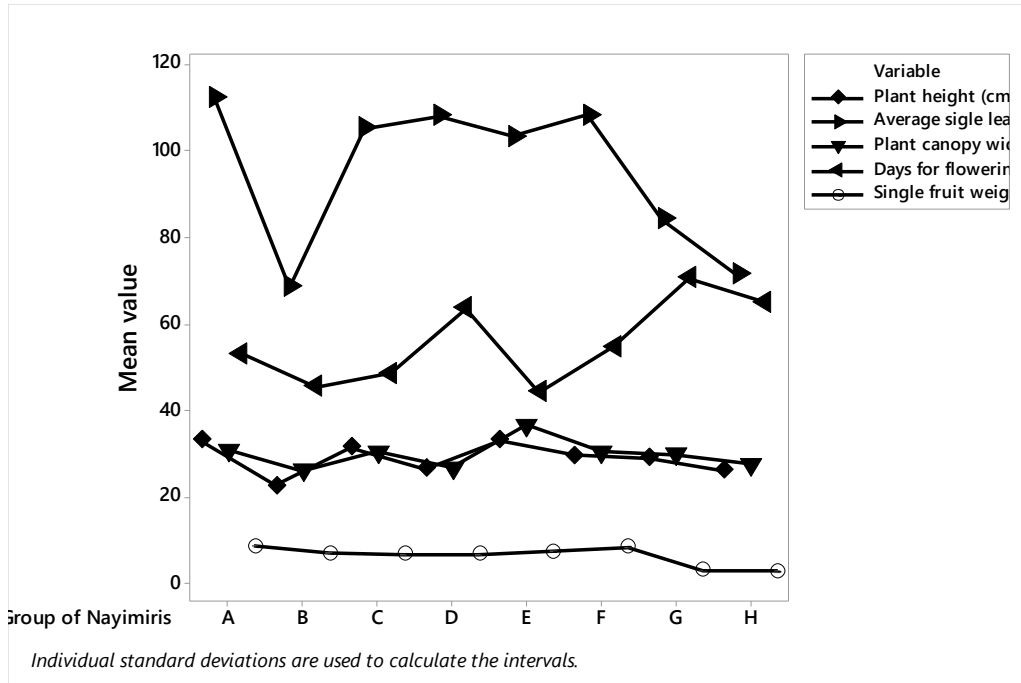


Figure 2. Different mean values of Plant height, Average single leaf area, Plant canopy width and days to flowering among the varieties and single fruit weight.

The variations of different phenotypes or morphological characters were recorded among varieties at various levels. It may be due to the genotypical deviations among the Naimiris varieties studied. It is also very difficult to address the reason for the phenotypes changes in this study. In a study (Sharangi *et. al*, 2019) stated that there were qualitatively identical landraces that are quantitatively different. Similarly, there are quantitatively identical landraces that are qualitatively different. Therefore, it is difficult to clarify the links between these germplasms without making reference to other characterization procedures.

Table 2. Cumulative evaluation of characteristics in Naimiris.

Category	PLH	ASLA	PCW	DTF	SFW
Good	C,E	A,F,D	A,E	H,D,F,A	G
Medium	G,F	E,C	A,F,C,G,H	C,B,E	B,E,C,D
Poor	A,B,H,D	G,H,B	B,D,D	G	G,H

APLH-Average plant height, ASLA-Average single leaf area, APCW- Average plant canopy width, ADTF – Average day to flowering, ASFW- Average single fruit weight, G-Good, M-Moderate, P-Poor

In this study, single fruit weight showed high variation among the groups. This genotypical difference might be occurred due to the presence of natural exploitation of heterocyst in chili with its original habitats. It was reported by (Doshi and Sukla2000), who observed that heterosis effect is high for traits such as number of fruits per plants, fruit length, fruit girth, and fruit shape index and fruit volume.

CONCLUSION

Based on the phenotypic and yield characters analyzed, this study identified eight unnamed varietal groups of Habanero chilli (Naimiris) which found in Sri Lanka. Further, Variety **F** showed better qualitative

Table 3. Ranking of varieties according to their characteristics

Variety/group	APLH	ASLA	APCW	ADTF	ASFW
A	P	G	M	G	G
B	P	P	P	M	M
C	G	M	M	M	M
D	P	G	P	G	M
E	G	M	G	M	M
F	M	G	M	G	G
G	M	P	M	P	P
H	P	P	M	G	P

APLH - Average plant height, ASLA - Average single leaf area, APCW - Average plant canopy width, ADTF - Average day to flowering, ASFW - Average single fruit weight

and quantitative performance out of the eight varieties studied. Variety named as **A** played second best compared to other varieties. The result also found that there was a positive correlation between the chilli pod size and phenotypic characters such as plant height, single fruit weight and days for flowering among the varieties studied. This genotypical difference might be occurred due to the presence of natural exploitation of heterocyst in chili with its original habitats.

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