

**MI WARANIYA 01 -THE IMPROVED VARIETY OF THE
TRADITIONAL CHILLI (*Capsicum annuum* L.) CULTIVAR “
WARANIYA MIRIS” A BETTER OPTION FOR LOW COUNTRY WET
ZONE CHILLI GROWERS**

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ABSTRACT

“Waraniya Miris”, is a traditional green chilli (*Capsicum annuum* L.) cultivar grown in home gardens and small vegetable farms “Koratuwa” mainly in Western Province of Sri Lanka. The traditional cultivar was popular among the chilli growers as it has some desirable agronomic characters and high field tolerance to chilli virus diseases and long economic life span in the field. Well matured pods can be used as green chilli and well grown pods before maturation are used as an alternative for capsicum due to mild pungency. Continuous mixing due to open pollination and use of genetically mixed population of seeds by the growers were the major threats for the existence and maintenance of the cultivar with better traits. This study was conducted at the Field Crops Research and Development Institute (FCRDI), Mahailuppallama, Sri Lanka with the objective of purifying and selecting a well adapted variety combined with better agronomic traits linked with the traditional cultivar, through purification and selection processes from out-crossed segregating population. Purified cultivar was evaluated with another promising green chilli line MICH-06 including recommended variety KA-2 at different locations in the dry, intermediate and wet zones of Sri Lanka. The improved promising line Waraniya Selection showed a higher positive mean deviation (D) across environments, performed better for yield and other agronomic traits and was moderately tolerant to leaf curl complex and virus diseases. The promising line was recommended and released for extensive cultivation in wet zone areas and all island home gardens under the name of “MI Waraniya 1”.

KEY WORDS: Agronomic traits, Breeding line, Purification, Segregating Population, Selection, Traditional Cultivar

INTRODUCTION

Chilli or Pepper is considered as the most popular spice and condiment in the world, commonly grown in Indian subcontinent and one of the major cash crops in Sri Lanka. Chillies are consumed daily by one-quarter of the world's population, and the rate of consumption is growing. Despite their fiery "hotness" chillies are one of very popular spices known for medicinal and health benefiting properties. Chilli peppers have amazingly high levels of vitamins A, C and B complex, minerals and also good in other antioxidants such as flavonoids like beta carotenes.

The total extent under chilli cultivation in Sri Lanka is around 15,000 ha and 3/4th of the production reach to the market as green chillies (Agstat 2013). The weather conditions prevailed throughout the country are favourable for green chilli cultivation. In wet zone areas of the country farmers used to cultivate chilli in a very small scale or in back yard gardens with other crops to have green chilli for their household consumption and sell the rest in village market or fair. However, most of the varieties developed and released by the Department of Agriculture so far were targeted on the farmers who cultivate chilli in major growing areas of dry and intermediate zones of Sri Lanka. Hence, chilli growers in wet zone areas used to grow locally available cultivars or whatever the material they had as farmer saved seeds.

"Waraniya Miris", a traditional land race or cultivar of *Capsicum annum* L. grown in small land holdings in Western Province and Kegalle, Galle and Matara districts was a very good option for green chilli in wet weather condition prevailing in the low country wet zone areas of the country. Also the cultivar was popular among farmers and consumers because of its attractive appearance with yellowish green colour, mild pungency and suitability as a substitute for capsicum (Malu Miris). Even though, the cultivar showed some variations in morphologically it has very good market as compared to the other recommended chilli varieties due its unique taste and aroma after cooking. The problems encountered by the growers of Waraniya Miris were the lack of purified quality seeds of a pure cultivar and therefore, mixed nature of the characters of which the size, shape and the colour of the pods could be seen in the harvest.

Promising progenies were identified through a series of selection and purification process of segregating heterogeneous population of a landrace in conventional breeding practiced in chilli. With the generation advancement process, most of the desirable characters can be fixed by alternate practice of self pollination and cross pollination techniques within the selected chilli progenies (Kannangara, 2012).

MATERIALS AND METHODS

The germplasm of red ripened pods of Waraniya Miris cultivar were collected from open pollinated fields at Matugama, in Kalutara district where the crop had been traditionally cultivated for decades. The extracted seeds obtained from the mixed Waraniya Miris population were cultivated and purified through generation advancement at FCRDI, Mahalluppallama during 2006 to 2012 period to obtain a uniform progeny with appropriate agronomic characters. The purification and selection procedure was started during 2006/2007 *maha* season and was continued up to 2010/2011 *maha*. Single plant selection and progeny selection methods were followed by allowing the plants self pollination followed by open pollination respectively. After satisfying the level of uniformity in the progeny mass selection method was practiced to produce the nuclear seeds of the purified cultivar. Yield and other agronomic attributes; viz, tall and erect plant architecture, downward position of pedicel attachment, attractive yellowish green color pods, long pod size and elongate shape, glossy smooth surface with moderate wrinkles and mild pungency with tolerance to chilli leaf curl complex (LCC) and virus diseases were considered while purification and selection process. Insect proofed nettings were used to maintain self pollination and 400 meters isolation distance and rouging were practiced to avoid unwanted mixing during open pollination. The crop was maintained under minimum spraying condition and other cultural practices were done according to the DOA recommendations during the variety development period. The severity of LCC was scored according to 0-5 scale at 14 days intervals from two to fourteen weeks period after transplanting.

Evaluation of cultivar in NCVT/VAT

The adaptability and stability of the purified cultivar Waraniya Selection was tested with another promising green chilli line MICH-06 with recommended

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variety KA-2 at five locations (research stations) in four agro-ecological zones; at Horana (WL₁), Makandura (IL_{1a}), Kalpitiya and Thinnaveli (DL₃) and FCRDI at Mahalluppallama (DL_{1b}) under the National Coordinated Varietal Trials in *yala* 2010 and *maha* 2010/2011. The pod yield and the level of farmer preference of purified cultivar was evaluated in *yala* 2010 and *maha* 2010/2011 seasons under the Varietal Adaptability Trials (VAT) in farmer's fields giving more emphasis on low country wet zone areas. Yield data were analyzed using the deviation of plot-yield from the environmental mean by the method proposed by Abeysiriwardena *et al.* (1991). Selection of highly adaptable varieties was done based on the highest positive mean deviation (D) and adaptability rank across environments. The promising line Waraniya Selection was produced to Varietal Releasing Committee of the department of agriculture for recommendation and release.

RESULTS AND DISCUSSION

Adaptability and stability of the promising line Waraniya Selection was tested in different agro-ecological regions during *yala* 2010 and *maha* 2010/2011 seasons. According to the data significantly higher mean yields were obtained by the promising line in both seasons. It has performed better in *maha* than in the *yala* season. It has showed higher mean deviation value over the tested entries with non significant stability parameter value during 2010/2011 *maha* proving its high stability and adaptability (table 1 and 2).

Table 1. Mean deviation (D) and Stability parameter (S²) values of tested entries under NCVT in *yala* 2010.

Variety/accession	Mean green chilli yield (t/ha)	Mean deviation (D)	Stability parameter (S ²)
MICH-06	14.93 b	0.057 b	26.90 s
Waraniya Selection	17.25 a	2.376 a	82.79 s
KA-2	12.44 c	-2.433 c	19.07 s
CV%	13.65		

*Mean yields of same letters are not significantly different at 5% probability level (DNMRT) NS-Non significant

Table 2. Mean deviation (D) and Stability parameter (S²) values of tested entries under NCVT in maha 2010/2011.

Variety/accession	Mean green chilli yield (t/ha)	Mean deviation (D)	Stability parameter (S ²)
MICH-06	15.23 b	0.23 b	ns
Waraniya Selection	19.25 a	4.25 a	ns
KA-2	10.62 c	-4.48 c	ns
CV%	12.56		

*Mean yields of same letters are not significantly different at 5% probability level (DNMRT) NS-Non significant

Varietal Adaptability Trials (VAT)

Yield and farmer preference for the farmers on proposed candidate varieties were evaluated in 2010 *yala* and 2010/2011 *maha* seasons at different locations, giving more emphasis to wet zone chilli growers. Two tested varieties including candidate variety gave higher positive mean deviation in both seasons. The stability parameter was non significant in the candidate variety showing high adaptability compared to the check variety KA-2 (table 3 and 4).

Table 3. Mean deviation (D) and Stability parameter (S²) values of tested entries under VAT in yala 2010.

Variety/accession	Mean green chilli yield (t/ha)	Mean deviation (D)	Stability parameter (S ²)
MICH-06	14.15 b	0.406 b	ns
Waraniya Selection	16.59 a	2.772 a	ns
KA-2	10.13 c	-3.529 c	ns
CV%	11.35		

*Mean yields of same letters are not significantly different at 5% probability level (DNMRT) NS-Non significant

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Table 4. Mean deviation (D) and Stability parameter (S²) values of tested entries under VAT in maha 2010/2011.

Variety/accession	Mean green chilli yield (t/ha)	Mean deviation (D)	Stability parameter (S ²)
MICH-06	11.60 b	-1.10 b	0.028 ns
Waraniya Selection	16.82 a	4.12 a	0.023 ns
KA-2	9.70 c	-3.02 c	1.850 s
CV%	12.05		

*Mean yields of same letters are not significantly different at 5% probability level (DNMRT) NS-Non significant

Severity of leaf curl complex disease (LCC) of new breeding lines and recommended varieties during 2011 *yala* season at Mahailuppallama is given in Table 5. No damage was observed at the early stage of the crop in Waraniya Selection than the rest of the entries including control varieties. Even at 98 days after planting, the breeding line Waraniya Selection showed the least susceptibility to LCC than the recommended varieties tested (table 5).

Table 5. Severity of LCC of new breeding lines with the recommended varieties in 2011 *yala* season at Mahailuppallama

Variety/ Breeding line	LCC Severity days after planting (DAP)					
	28	42	56	70	84	98
MICH-6	0	0	1	1	2	3
PC-1	0	0	1	1	2	3
Galkiriyagama selection.	0	1	1	2	2	3
TVC-4	1	2	2	3	4	4
TVC-5	1	2	2	3	4	5
<i>Waraniya</i> Selection	0	0	0	0	1	1
MI-2	1	1	2	3	4	5
KA-2	0	0	1	2	2	3
MI-Green	0	1	1	2	3	3

Severity of LCC was increased according to 0 - 5 scale where 0 = No symptoms – immune; 1 = 1-10% of leaves affected-Resistant/ Tolerant; 2 = 11-25 % of leaves affected-Moderately Resistant/ Tolerant; 3 = 26-50% of leaves affected-Moderately Susceptible; 4 = 51-75% of leaves affected-Susceptible; and 5 = 76-100% of leaves affected-Highly Susceptible.

Reactions against the virus diseases (CMV & CVMV) revealed that promising line Waraniya Selection has showed significantly least susceptibility as compared to other tested entries including recommended varieties. However susceptibility to fungal diseases was similar to the recommended variety KA-2 and promising line MICH-06 (Table 6).

Table 6. Reaction of new chilli lines and recommended varieties against Anthracnose, Cercospora leaf spot, Coanepora blight, Cucumber mosaic virus and chilli leaf curl virus during maha 2009/2010

Variety	Anthracnose	Cercospora leaf spot	Coanepora blight	Cucumber mosaic virus	Chilli leaf curl virus
Arunalu	2.66 c	63.89 abc	96.29 a	16.66 d	34.26 c
MI-Green	5.78 c	50.92 c	74.07 cd	55.55 a	51.85 bc
Galkiriyagama selection	9.92 c	9.2 c	84.92 abc	23.57 cd	52.80 bc
MICH-6	49.48 ab	87.96 a	93.21 a	41.66 b	65.74 b
Hot-Beauty	60.89 a	91.66 a	75.92 bcd	35.18 b	96.29 a
ICPN 18 sel.	59.55 a	86.11 ab	82.41 abcd	19.44 d	57.40 b
CAH 36	34.26 b	80.21 ab	67.93 d	23.57 cd	68.99 b
Waraniya Selection	32.14 b	66.56 abc	79.36 abcd	9.26 e	7.40 d
KA-2	45.59 ab	58.65 bc	91.53 ab	65.42 a	67.26 b
CV%	34.71	22.74	11.69	21.46	21.29

* Means having the same letter under each column are not significantly different (p=0.05) CMV-Cucumber mosaic virus CLCV- Chilli leaf curl virus

CONCLUSIONS

Improvement of traditional cultivar through purification and selection process conserving the genetic make-up and fixing better attributes from a segregating population is an important breakthrough in chilli varietal improvement. The purified cultivar, Waraniya Selection showed a high yield potential of more than 19 t ha⁻¹ of green chilli with high adaptability to wet zone areas of the country. The purified cultivar possesses moderate and comparable level of tolerance to LCC at the field level. The promising line showed very high level of tolerance against CMV and CLCV diseases which are current menaces for chilli production in Sri Lanka. The improved promising chilli landrace was recommended and released as a dual purpose (green chilli & curry type) variety suitable for wet zone and the home gardens in Sri Lanka.

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