STUDYING THE PERFORMANCE OF CHILLI (*Capsicum annuum* L.) IN FARMERS' FIELDS AND ANALYSING THE PRODUCTION AND MARKETING POTENTIAL IN SECTOR - 03 OF KALUTHAWALAI VILLAGE

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ABSTRACT

This field research was conducted during the period of March 2007 to September 2007 in sector-03 of Kaluthawalai, Manmuni South Erruvil Pattu in Batticaloa district, in order to study the performance of chilli crop in farmers' field and analysing the production and marketing potential in sector-03 of Kaluthawali village. Three farmer's fields were selected in Kaluthavali village and ten plants were selected randomly in each field. Totally 30 plants were selected for this study. Performance of chilli plants were observed under farmer's management practices. The data on canopy height, primary branch number, leaf length and leaf width, fruit width and fruit length, number of pods per plant and total yield were collected in this experiment and were statistically analyzed to determine the level of significance. The selected plant of PC variety in this study showed significant variation ($p<0.05$) in growth parameters such as canopy height at 50% flowering, canopy height at 1st harvesting and canopy height at 3rd harvesting , primary branch number, fruit weight and fruit length.

The correlation studies revealed that some characters studied were positively correlated: they were canopy height and yield per plant; primary branch number and yield per plant; fruit length and yield per plant; fruit width and yield per plant; some other characters were negatively correlated: they were days to flowering and canopy height; days to fruiting and primary branch number; fruit width and fruit length and days to fruiting and fruit weight. It is clearly seen that selected plant of PC variety showed a wider variation in several traits of agronomic importance and hence, selection would be positively approached for particular characters and these specific measures use in chilli improvement programme, although yield and adaptability are the first and foremost criteria. Further, the major problem faced by farmers was the market price fluctuation and farmers were cheated by traders by the reason of quality level of chilli crop. Considering the result in general, it can be suggested that a genotype similar to PC variety is suitable for Batticaloa district. Crop improvement program in present variety is a need to rectify the defects in order to encourage production, productivity and market potential.

Key words: Chilli, Growth parameters, Price fluctuation, Productivity

MATERIALS AND METHODS

This experiment was conducted during the period of March to September of 2007 in Kaluthawala-3, Manmuni South Erruvil Pattu in Batticaloa district. Annual rainfall varies from 864 mm to 3081 mm and most of the rain being received during the month of October to January. Rainfall is both inter-monsoon and north-east monsoon type. Relative humidity shows much variation and is related to the rainfall pattern and temperature variation. Temperature ranges from 25° C to 36° C. The soil type is sandy loam.

Experimental variety
PC variety of chilli was used in this experiment.

Experimental field
Three farmer's field was sleeted in the Kaluthawali-3 village. Each field had some distance form another fields. Stage of the crop in this field was before flowering.

Chilli plants selection for data collection
Ten chilli plants were selected randomly. Plant stage is before flowering.

Measurement and Observation
After establishment of seedling data collection commenced and measurement were taken in the selected field in Kaluthawalai village. Some data and measurement were taken from selected plant once a week and some data and measurement were taken at fifteen days interval.

Questionnaire survey
Survey was done for data collection of marketing potential of chilli, production potential of chilli, farmer's details and cultivation details in the selecting village of kaluthawalai-3.

Statistical analysis
Collected data was subjected to statistical analysis of variance using SPSS (Statistical Package of Social Science) and Micro Soft Excel computer package. Some data were compared in table format. In addition to these, the data were used for correlation analysis.

RESULTS AND DISCUSSION

The primary objective of this study was to identify the plant population structure, management environment and market potential of locally grown chilli variety popularly called by the name "PC" in sector-03 of Kaluthawalai village. Marketing potential was analyzed by using of questionnaire survey and morphological characters were analyzed from collected data and measurement.

Canopy height

Canopy height at 50% flowering showed a highly significant positive correlation ($r=0.068$; $p=0.01$) with canopy height at first harvesting and highly significant positive correlation ($r = 0.700$; $p = 0.01$) with canopy height at third harvesting (Table 4.2). Canopy height at first harvesting showed highly significant positive correlation ($r = 0.987$; $p = 0.01$) with canopy height at third harvesting. This suggested that there was indicated inheriting relationship between the different stages of canopy height. Canopy height showed positive correlation with yield and this correlation rate was increased with different stage of height therefore canopy height determined the yield directly or indirectly in PC variety. This character is important for plant selection.

Earlier at was reported, the yield of pods in chilli was positively correlated with height of canopy. Where as, a negative correlation with earliness existed (Jamal Hussain, 1977) but this study did indicate a similar relationship. High genetic advance has been reported for canopy height and number of primary branches showing the prospect of improving yield by selection of these characters (Meshram, 1987). Hence growth at first flowering may have impact on the final canopy height, and canopy structure, which is important for higher yield. In other words, early vigour appears to be an important attribute to their entire performance of chilli during its life cycle and to their production of fruit.

**Table 1: Correlation matrix of different morpho-agronomic characters**

	CH50%F	CHIH	CH3H	BN	LL	LW	FWE	FWI	FL	DFR	DFL	TY
HIH	0.681**											
CH3H	0.700**	0.987**										
BN	0.190	0.298	0.374*									
LL	-0.070	0.063	0.042	-0.063								
LW	0.207	0.246	0.319	0.187	0.033							
FWE	0.026	-0.044	0.021	0.360	-0.049	0.567**						
FWI	0.009	0.178	0.210	0.286	0.302	0.193	0.226					
FL	0.241	0.265	0.317	0.354	0.366*	0.375*	0.438*	-0.261				
DFR	-0.096	-0.029	-0.018	-0.270	-0.013	0.029	-0.082	-0.005	-0.142			
DFL	-0.247	-0.178	-0.206	0.046	-0.219	-0.242	0.176	0.012	-0.002	0.252		
TY	0.122	0.140	0.205	0.200	-0.121	0.745**	0.751**	0.269	0.285	0.045	0.092	

** - Significant at 1% (p =0.01) level

* - Significant at 5% (p =0.05) level

Table 2. Mean and Standard deviation of some characters

| Characters	Mean	Standard deviation
Canopy height at 50% 3rd harvesting	96.6000	20.58222
Number of primary branches	7.0333	1.29943
Fruit weight	2.4037	0.59977
Fruit number per plant	174.3000	37.60149
Yield per plant	419.2000	136.05232
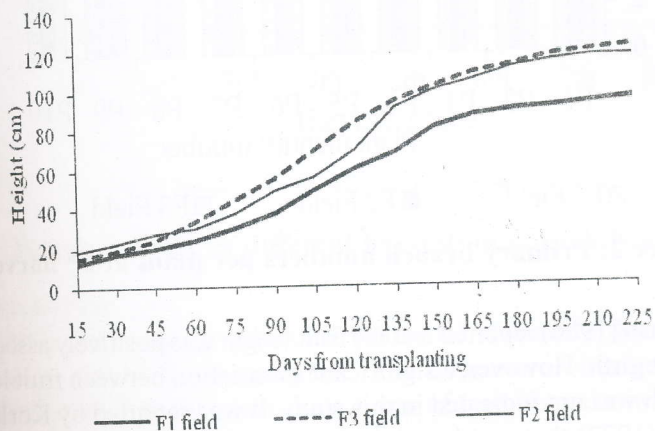
Figure 1: Mean height of plant at 15 days interval from transplanting.

Primary branch number

A primary branch means branches arise from main stem. Primary branch number showed significant positive correlation (r = 0.374; p = 0.05) with canopy height at third harvesting and positive correlation with canopy height at 50% flowering and first harvesting. Primary branch number showed positive correlation with yield of mature green pods per plant.

This suggested that primary branch numbers determined by canopy height and branch numbers determined the yield. Therefore high number of branches will increase pods number per plant and yield. This character is important for plant selection.

Table 3. Fruit length and width at third harvesting

	Fruit length (cm)			Fruit width (cm)		
	F1	F2	F3	F1	F2	F3
Means	4.62	3.85	4.60	1.36	1.37	1.32
Standard deviation	0.820	0.907	0.724	0.241	0.170	0.079
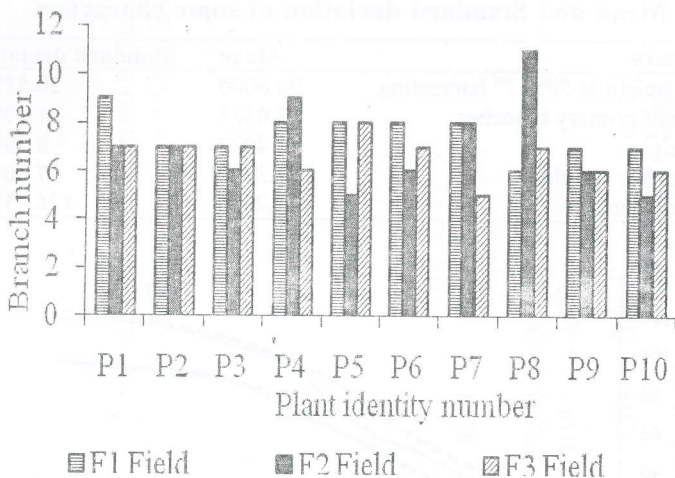
**Figure 2: Primary branch numbers per plant at 6th harvestin**

Balakrishan (1980) reported that the fruit length was positively associate with fruit girth. However, a significant association between fruit lengt and width was not indicated in this study. It was reported by Korla an Rastong (1977) that pod length had a negative effect on yield did no appear to be a strong one.

Yield of mature green pods per plant

The yield was estimated from the first six harvests of mature greer pods per plant. Yield of mature green pods per plant differed and showe remarkable difference among the selected plant in different fields.

Yield showed highly significant positive correlation ($r = 0.745$; $p =$ 0.01) with leaf width and highly significant positive correlation ($r =$ 0.751; $p = 0.01$) with fruit weight. Yield showed positive correlation with canopy height, primary branch number, fruit width and fruit lengt but negative correlation with days to flowering and fruiting. Primar branch number, canopy height and fruit weight was effected on yield Therefore high yield plant has high number of primary branches, highe canopy height and high number of pods per plant.

Height of plant and number of primary branches had a direct relationship with yield of pods in chilli. The direct and indirect effects of varieta yield components had been identified (Singh and Singh, 1974). Number of branches exerted a maximum direct effect in yield as reported (Jama Hussain, 1977)
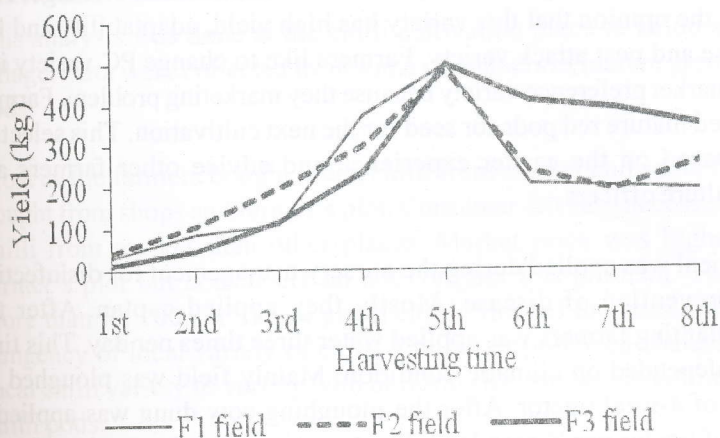
Figure 3: Yield at different harvesting in each field

Farmer survey

Marketing potential, production potential, farmer's details and cultivation details were analyzed. The data were obtained using structured questionnaires and three types of questionnaire were used for data collection.

Farmers information

Experimental fields were owned by farmers. They cultivated more than ¼ acre of land. Most of the farmers were educated and also they cultivated crops are ten years. Some farmers participated in training program about cultivation practices. These training programs were arranged by certain Non Government Organization and International Non Government Organization. Some workshop was arranged by The Department of Agriculture in the Batticaloa district. They are involved in farming or chilli cultivation as a secondary work or income source.

Cultivation information

Chilli was cultivated only one season in Yala in Kaluthawalai-3 village during this study period. Reason for chilli cultivation in this village was identified as high profit, own consumption, advised by officers, availability of seeds, low human labour and favorable condition of soil or climate. Most of the farmers did not cultivated chilli continuously and they changed crop season to season or each cultivation time because of the reason to prevent pest and disease outbreak and soil conservation. Some farmers brought nursery plants from other farmers. They were spending money for purchasing nursery plant at Rs.0.50 per plant.

Farmers selected only PC variety of chilli in Kaluthawalai-3 village. They are in the opinion that this variety has high yield, adaptability and low disease and pest attack variety. Farmers like to change PC variety into high market preference variety because they marketing problem. Farmers selected mature red pods for seed for the next cultivation. This selection was based on the earlier experience and advice other farmers and agriculture officers.

Chemical was applied during the nursery management for disinfection and prevention of disease. Mostly they applied captan. After the transplanting farmers was applied water three times per day. This time were depended on climatic condition. Mainly field was ploughed by using of 4-weel tractor. After the ploughing cow dung was applied cube of tractor per ½ acre land. Plant spacing was observed at 60cm 30cm. any other special practices were not observed. Urea, TSP, MOP and Chilli mixture fertilizers were used in this chilli cultivation. Farmer did not follow recommended level. Weeding was done once a week by farmers manually.

Common pests observed were pod borer, cut warm, leaf eating caterpilla and leaf miner. Pod borer only attacked severally. Common disease such as leaf curl complex, mosaic virus, anthracnose and bacterial spot were observed but not severally attacked in these fields. Chemical such as Maxicrop, Admire, Carbofuran, Androhor and Diazind were applie for pest and disease control. Farmers did not follow the Agricultur offices' advices and recommended level of application. This was a indication of high percentage of chemical application. Mature gree pods were harvested at fifteen days interval. They feel that this wi increase yield in next harvesting. Most farmers harvested chilli eig times.Marketing of chilli was observed to be big problem by pri fluctuation. Most of the farmers were cheated by traders. This marketin problem must be considered by Department of Agriculture helps th farmers.

Green chilli traders

Few traders bought mature green chilli pods in Kaluthawalai villag Traders were from Kalmunai and Batticaloa but no any traders we present in Kaluthawali-3 village. Traders bought green chilli fro farmers and price ranged from Rs.30 to Rs.100 per 1kg of green chil Market price of chilli deviated from Rs.100 to Rs.130 per 1kg. Chil framers faced big problem by the price fluctuation. This green matu chilli pods were sold in Batticaloa and Kalmunai market only and oth markets do not accepted this chilli variety.

Green chilli consumers

This analysis was done at the chilli cultivation place in kaluthawali-3 village. Data were collected from some consumers of mature green chilli pods.

Most of the farmers bought green chilli from market and some farmers bought from shops and farmer's plot. Consumer felt easy access of green chilli from market than other places. Market price was higher than farmer's plot but consumers do not consider this problem. They pay more than Rs.100 per 1kg of green chilli. Most of the consumer liked pungency of local variety of chilli. Consumer preferred changes from local chilli variety to variety with uniform size, shape and colour of the chilli pods.

CONCLUSIONS

Performance of PC variety of chilli tested in this study showed significant differences among the plants in some growth parameters such as canopy height, Primary branch number, leaf length and leaf width among the plants and some qualitative and qualitative characters deviated from the original PC variety.

In the cultivated PC variety, qualitative characters of PC variety such as growth habit, branching habit, leaf shape, fruit shape and colour, fruit surface, fruit set and calyx margins expressed variability within the field and between fields. The variation in these characters may be caused by the differences in genotypes or management or gene and environmental interaction. Quantitative characters of the PC varietal population viz. Plant height at different stage, primary branch number, number of pods per plant, yield per plant at different harvesting, days to flowering and fruiting, leaf length and leaf width, fruit length and width and fruit weight showed visible variability within the field and between fields. The difference in genotypes or environment or gene and environment interaction may be the probable attribute to such variation.

The correlation studies revealed that some character were positively correlated with others, while some characters were negatively correlated at significant level (p=0.05). The rest of them did not show any significant correlation with each other. Canopy height and primary branch number showed positive effect on yield that indicate management is important such as frequent watering, correct time and amount of fertilizer application and weed management. From the correlation study it is

possible to realize that growth in terms of canopy height at different stage has an impact on the canopy structure at first harvest and later stages. In other wards early vigour appears to be an important attribute to the entire performance of chilli. So to achieve high yield, selection for cultivation may be based on the plants with good canopy structure. Growth rate of PC variety followed the typical sigmoid graph. This indicates PC variety of chilli plants had indeterminate growth habit. Yield component such as number of pods per plant and fruit weight showed positive effect on yield. This suggested that management practices are very important from flowering period to harvesting period. Increase in the days to flowering delayed the fruiting that affected the yield.

PC variety expressed high level of fruit set, high number of pods per plant and higher yield in this experimental study. From the farmers point of view the major problem faced was the market price fluctuation. Farmers were cheated by traders or other purchasing members by the reason of low purity level of chilli. Most of the farmer's field showed variation in phenotypic characters, mainly fruit quality. Pungency of PC variety is preferred by consumer but they did not like different shape and colour of pod. They like green colour and large mature pods of uniformity.

Selection and developing genotype somewhat similar to original PC variety is considered necessary for farmer's cultivation as this is a high yielding and adapted variety. This consideration helps to increasing of consumer preference, marketing potential and production potential. Considering the result as a whole, it can be suggested that the chilli population of PC variety cultivated by the farmers is heterogeneous and showed variation in mopho-agronimic characteristic. Farmers deviated from the recommended cultural practices in their management process in term of spacing, pest management, fertilizer application, etc. However, they get good profit from the chilli crop of PC variety and they wish to continue with the same variety in the future. It is suggested that there is needed to improve this variety with desirable characters and this variety is adapted to the environment and growing condition.

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INTRODUCTION

Capsicum is cultivated in different parts of the world, of the total world consumption chillies account, for one third of the total. The voyage of Columbus that led to the discovery of red Chilli made this very fiery variety of spice known to the world. As a result, black pepper, which was a highly prized commodity in Europe, started facing stiff challenges from the new species of red chillies (Heiser and Smith, 1953). Chillies were historically known to be used to impart flavour and hotness to food. Many civilizations were known to be using this species, especially the Mayans and Aztecs. The very foundation of Mexican food is based on the essence of chillies.

Chilli is one of the most important cash crops grown in Sri Lanka. It has become an essential ingredient in Sri Lankan meals. In Sri Lanka, Chilli can grow throughout the year, in area of altitude range from sea level up to 2000 m, and is extensively cultivated in the dry zone, especially in Southern and North Central Provinces during Yala or South West monsoon season under irrigated condition (Department of Agriculture, 2001).

Chilli types usually are classified by fruit characteristics, i.e. pungency, colour, shape, flavour, size, and their use (Bosland 1992). Department of Agriculture has recommended five chilli varieties up to now namely MI-1, MI-2, KA-2, Arunalu and the recently released variety MI-Hot (Department of agriculture, 2001).

A large extent under chilli is cultivated in the dry zone especially in North Central province and the intermediate zone. At present, major chilli growing districts are Anuradhapura, Moneragala, Ampara, Vavuniya, Kurunegala, Hambantota and Mahaweli System H. Other chilli growing districts are Batticaloa, Trincomalee and Jaffna. (Department of agriculture, 2001).

Objectives

An assessment and in depth analysis were performed with a locally grown chilli populations popularly called by the name "PC" in "Kaluthawala" village in the district of Batticaloa with respect to Population structure and its variation, Production environment, Response of genotypes to environment and Market potential.

Selection of promising strains in term of production potential, marketing potential and resistant or tolerance to biotic and abiotic stresses from locally grown chilli population.