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Variability in herbage yield and essential oil content of different genotypes of *Cymbopogon*

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ABSTRACT

Three cultivars viz Chilharit, Karishna and CKP-25 of *Cymbopogon flexuosus*, two cultivars viz Bio-13 and Jor Lab C-2 of *C winterianus* and two cultivars viz Tarishna and PRC of *C martinii* were planted at different densities (60 x 30 cm, 60 x 45 cm, 75 x 75 cm) at experimental farm of Horticultural Regional Research Station, Dhaulakuan, Sirmour, HP during July 2010 for yield and essential oil content evaluation. Significant variations were observed for all the growth and yield parameters in tested genotypes planted at various densities. Higher herbage yield to the tune of 8 per cent was recorded at low planting density (75 x 75 cm) as compared to higher planting density (60 x 30 cm.). Oil content was high in summer season harvest as compared to winter season at low planting density of 75 x 75 cm.

Keywords: *Cymbopogon*; herbage yield; oil content; variability

INTRODUCTION

The entire mountainous region of the Western Himalayas has vast repository of medicinal herbs. It contain 50 per cent plant drugs mentioned in British Pharmacopoeia catering to 80 per cent Ayurvedic, 46 per cent Unani and 33 per cent Allopathic systems of medicine. Himachal Pradesh situated in the centre of Western Himalayas is bestowed with rich medicinal flora. The topographical, geographical location and edapho-climatic conditions are suitable for cultivation of various medicinal plants. According to World Health Organization (WHO) about 25 per cent of human medicines are derived from plants and up to 80 per cent of world people rely on plants for their primary health care (Chauhan and Bhardwaj 2005). Demand of Ayurvedic medicines is increasing day by day. There is a compelling obligation on the society to conserve the important plant species of medical value. To make available fresh, genuine and quality raw material for manufacturing standardized and efficacious drugs and ease pressure on natural resources there is an utmost need to introduce the cultivation of MAPs into the cropping systems of our

country. Therefore an attempt has been made in this manuscript to evaluate three genotypes of *Cymbopogon* at various planting densities for yield and essential oil content variation during summer and winter months.

METERIAL AND METHODS

Studies were carried out at experimental farm of Horticultural Regional Research Station, Dhaulakuan, Sirmour, HP (30° 30'20" N and 77°20'30" E at 470 m elevation) situated in sub-tropical, sub-mountain low hill zone receiving around 1,900 mm rainfall annually. Average minimum temperature of 3.7°C (December) and maximum 36.4°C prevailed at the experimental site. Soil was sandy loam with pH 6.5-8.0 and organic carbon of 0.45 per cent. Soil was medium for N and K and high for P.

Trials were laid in split plot design with three replicates using spacing in main plots and varieties in sub-plots. There were 63 plots of 4 x 4 m accommodating all the possible treatment combinations. Two propagates (slips) of each variety were planted at 60 x 30 cm, 60 x 45 cm and 75 x 75 cm spacing during July 2010 in a well prepared field supplemented with farm yard manure at the rate of 100 q/acre. A plot of $1m^2$ was demarcated under each treatment (Khan 1974) for recording number of tillers per clump, tiller height (cm), herbage yield (q/ha) and per cent oil content under each treatment during second week of May and November and steam distilled. The oil content per cent was expressed on per cent volume/weight basis. Data on above parameters were recorded for two consecutive years (2011-12) and results on average basis are presented.

RESULTS AND DISCUSSION

Various spacing treatments significantly affected growth and yield parameters in different genotypes of *Cymbopogon* (Table 1). Decrease in planting density showed direct proportional relationship with tiller height and inverse relation to tillers per plant, herbage yield and oil content due to lack of competition for growth resources at low planting density and vice-versa. Planting density influences local environment and growth attributes of plants. Competition is the most frequent reason for reduced yield as reported by Szott et al (1991) that supports the present findings. Variety Chilharit of *Cymbopogon flexuousus* produced maximum number of tillers per clump compared to all other varieties at given spacings while the minimum tillers were recorded in variety PRC of *C martinii* at lowest planting density. Tillering is the end product of reproduction through vegetative means and ability to produce tillers was maximum at lowest planting density. Negative response of tiller height to low planting density in comparison to tillers per plant in the present study is in accordance with the findings of

Table 1. Growth and herbage yield parameters in different genotypes of *Cymbopogon*

Genotype	Spacing								
	60 x 30 cm			60 x 45 cm			75 x 75 cm		
	Tillers/ plant	Herbage yield (q/ha)	Herbage height (cm)	Tillers/ plant	Herbage yield (q/ha)	Herbage height (cm)	Tillers/ plant	Herbage yield (q/ha)	Herbage height (cm)
Chilharit	55.6	118.4	112.6	61.7	127.4	110.4	71.4	135.2	108.2
Krishna	48.3	114.3	128.3	54.4	122.8	124.8	63.5	130.8	121.3
CKP-25	43.5	108.6	108.5	49.3	114.6	105.1	58.7	119.4	102.4
Bio-13	38.7	87.4	66.7	47.6	82.3	64.2	58.7	77.8	62.5
Jor Lab C-2	35.2	81.8	75.3	43.4	77.8	73.6	43.4	72.5	70.5
Trishna	25.4	78.4	124.3	32.8	82.4	123.2	43.7	85.3	120.4
PRC	22.7	73.8	121.4	28.2	78.6	121.8	37.4	82.1	118.2
Mean	38.5	94.7	105.3	45.3	98.0	103.3	53.8	100.4	100.5
$CD_{0.05}$	6.7	7.9	10.4	6.4	8.2	11.3	7.1	8.8	12.3

Table 2. Per cent oil content variation in different genotypes of *Cymbopogon*

Genotype	Spacing					
	60 x 30 cm		60 x 45 cm		75 x 75 cm	
	Summer	Winter	Summer	Winter	Summer	Winter
Chilharit	0.53	0.48	0.62	0.56	0.74	0.66
Krishna	0.76	0.71	0.83	0.77	0.93	0.85
CKP-25	0.47	0.43	0.56	0.50	0.51	0.47
Bio-13	0.78	0.72	0.83	0.78	0.85	0.78
Jor Lab C-2	0.86	0.80	0.91	0.86	0.94	0.86
Trishna	0.35	0.32	0.44	0.40	0.56	0.49
PRC	0.46	0.42	0.56	0.51	0.68	0.61
Mean	0.60	0.55	0.68	0.63	0.74	0.67
$CD_{0.05}$	0.09	0.07	0.08	0.06	0.06	0.07

Sharma (1989) who reported that if light is not a limiting factor height growth of plants is not affected considerably as plants display a tendency to grow more in height for capturing solar energy.

Tiller height and tiller number governed the herbage yield potential and oil content. Herbage yield was significantly high in Krishna variety that was at par with Chilharit of *C flexuousus* as compared to Bio-13 and Jar Lab C-2 of *C winterianus* due to lesser number of tillers per plant and tiller height. Genetic make up of the varieties to maintain productive potential high cannot be ruled out. Non-significant variations were observed in herbage yield of Chilharit and Krishna varieties of *C flexuosus* and Bio-13 and Jor Lab C-2 variety of *C winterianus*.

Per cent oil content in different genotypes of same species showed significant variations at each planting density due to inter-varietal variations (Table 2). Maximum oil content (0.94%) was recorded in Jor Lab C-2 of *C wintarianus* and minimum (0.43%) in CKP-25 variety of *C flexuosus*. Findings showed higher herbage yield potential to the tune of 8 per cent at low planting density (75 x 75 cm) as compared to high planting density (60 x 30 cm) in different genotypes of *Cymbopogon.*

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