

Plant Development and Yield as Prejudiced by *Perilla* (*Perilla frutescens* L.) Germplasm Lines in India Hill Condition

¹Abhishek Bahuguna and ²Birendra Prasad

¹Institute of Medicinal and Aromatic plants, Meahalchouri, Gairsain, Uttarakhand, India

²Govind Ballan Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India

Corresponding Author: Abhishek Bahuguna, Institute of Medicinal and Aromatic plants, Meahalchouri, Gairsain, Uttarakhand, India

ABSTRACT

Perilla is a mint plant (Lamiaceae family), *Perilla frutescens*, growing in the hills and mountains of East Asia (mainly India, China, Japan and Korea). It has been spread around the globe during the previous century; initially it was desired as a decorative garden plant, but then it escaped cultivation; as an example, it now grows in spots throughout most of the Eastern and Midwestern United States, described as an invasive weed. *Perilla* is an important spice and oil crop of the mountain region. The trial was conducted under the field conditions at college of forestry and Hill Agriculture, Ranichauri Campus. Eighteen germplasm lines were evaluated in observation rows along with two check varieties (Shillog and Jaihtig), during kharif of 2011. The experimental result depicted that the dissimilar genotypes showed wide difference for 50% flowering, maturity duration (%), plant height, number of primary branches plant⁻¹, thousand seed weight and seed yield plant⁻¹. Substantial variation among the genotypes for different characters might be used for further breeding programs.

Key words: *Perilla*, germplasm, plant growth, seed yield

INTRODUCTION

Perilla frutescens (L.) Britton (Family: Lamiaceae) is an underutilized crop of India Himalayas with potential utility in agriculture. *P. frutescens* is grown as established crop in China, India, Pakistan, Japan, Korea, Thailand and other Asian countries. Two botanical varieties are recognized: Var. *frutescens* an oil crop and var. *crispa* a medicinal or vegetable crop (Perry and Metzger, 1980). These are distinguishable on the basis of perfume and the resistance of seeds (Nitta *et al.*, 2003). *Perilla frutescens*, a tetraploid (2n = 40) according to (Yamane, 1950; Honda *et al.*, 1994) is unspecified to have main area of multiplicity in China its long history of cultivation (Nitta *et al.*, 2005). The *perilla* is a petite day, temperate region crops and he has been tailored to a semi-tropical atmosphere, mainly at high altitudes. It grows well on poor soils and has good resistance to water logging (Weiss, 1986). The major producing countries are Ethiopia, India, Pakistan, Bangladesh, South Africa, Zaire and West Indies. *Perilla frutescens* L. locally known as Bhanjir, beefsteak plant, Chinese basil, purple mint is an under exploited oilseed crop grown on the bunds of terraces. Leaves and inflorescence of the plant exude aroma, while the seeds yield edible oil. The extremely long maturity duration of the crop is posing problem in proper seed setting as the crop flowers in September coinciding with cold temperature stress and are poor yielders. *Perilla* seed oil has also been used in paints, varnishes, linoleum and printing ink and volatile oil of the plants

are also used in aromatherapy and for perfume. In the absence of any released cultivar traditional cultivars are still being cultivated. The crop, however, fails to produce satisfactory grain yield at hills in Uttarakhand. Genotypes suitable for Uttarakhand Himalayan conditions have not been identified so far due to the lack of effective selection criteria, narrow genetic base and complex genetic control of acclimatization. Climatic adaptation at non freezing cold stress depends upon the maintenance of normal growth and development of genotypes (Steffen *et al.*, 1989). Hence, in this investigation genotypic differences in climatic adaptation were examined on seedling characters and grain yield of twenty five genotypes of perilla. The main use is for the extraction of edible oil, in India frequently as an extender for sesame seed oil. It also finds use for making soap and as an illuminant. The remaining plant matter is often used as a green manure (Weiss, 1986). The oil is most commonly extracted with expellers in India while in Bangladesh ghanis are more commonly used. The expressed oil is pale yellow, odourless and has a nutty taste. Due to the high linoleic acid content it has poor keeping properties (Kaul and Das, 1986; Weiss, 1986). Perilla leaf is aromatic, with main active ingredients being volatile oils dominated by monoterpenes (Tabata, 2000). Asian herbalists prescribe perilla for cough and lung afflictions, influenza prevention, restless fetus, seafood poisoning, incorrect energy balance, etc (Brenner, 1993).

MATERIALS AND METHODS

The seeds of *P. frutescens* were received from NBPGR Shimla. Plant growth and yield as influenced by *P. frutescens* germplasm lines in Uttarakhand hill condition were carried out during June 2011 at Uttarakhand University of Horticulture and Forestry, College of Forestry and Hill Agriculture, Ranichauri Campus, Tehri Garhwal, Uttarakhand. The eighteen germplasm lines (Table 1, Fig. 1) i.e., IC 003908, IC 003913, IC 006440, IC 006441, IC 006442, IC 006444,

Table 1: Evaluation of germplasm lines in perilla

Entry	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of primary branches	1000 seeds weight (g)	Seed yield (g plant ⁻¹)
IC 003908	134.50	185.50	74.50	7.20	3.39	4.39
IC 003913	133.50	184.00	79.25	6.70	3.51	4.69
IC 006440	138.50	190.50	82.80	7.40	3.55	4.34
IC 006441	144.00	195.50	76.50	6.90	3.60	4.56
IC 006442	146.00	197.50	81.60	8.80	3.29	4.63
IC 006444	139.50	191.00	96.60	9.20	3.69	5.19
IC 006447	134.50	186.00	80.50	8.80	3.39	4.56
IC 016443	133.50	184.50	85.00	7.30	3.58	4.07
IC 211608	143.50	193.00	89.20	7.60	3.47	3.96
IC 216268	142.00	192.50	93.60	9.40	3.68	3.57
IC 334313	128.50	178.50	99.10	9.60	3.41	3.67
IC 369449	126.00	175.50	76.40	8.80	3.47	3.94
IC 374494	134.00	185.50	88.30	8.30	3.59	3.49
IC 374590	126.00	175.00	89.00	8.60	3.61	3.71
IC 374593	121.50	172.50	84.30	7.80	3.63	4.64
IC 374609	126.50	175.50	86.10	8.60	3.66	3.40
IC 419477	142.50	193.50	98.25	9.40	3.54	4.11
IC 419564	133.00	184.00	77.70	8.20	3.56	4.98
SHILLOG (C)	133.50	185.00	84.40	9.30	3.62	6.12
JAIHTIG (C)	128.50	179.00	79.30	8.60	3.66	6.28

Replication 2, Design: RBD, Plot size: 3.00×0.45 m, Date of showing: 26-6-11

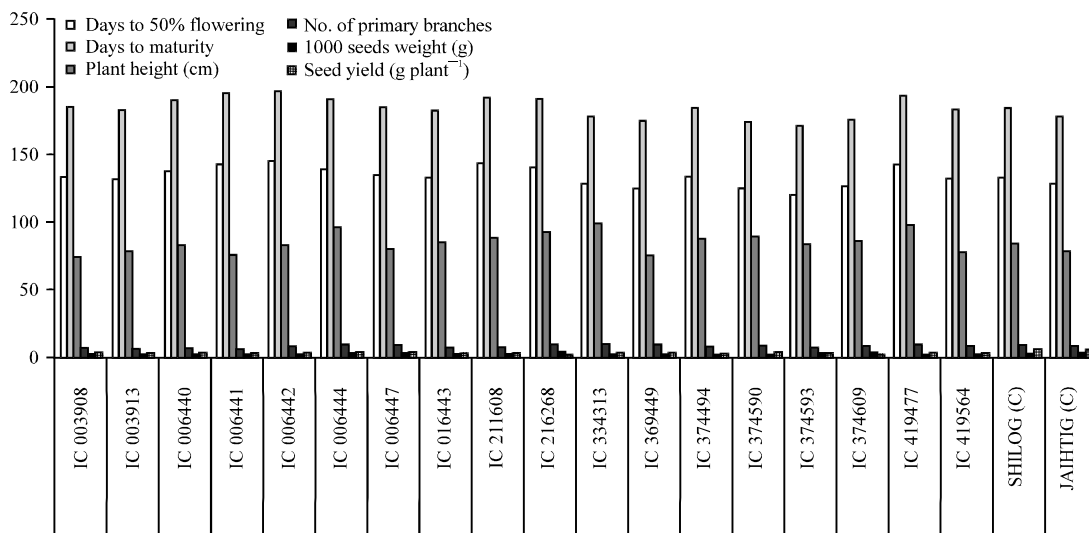


Fig. 1: Evaluation of germplasm lines in perilla

IC 006447, IC 016443, IC 211608, IC 216268, IC 334313, IC 369449, IC 374494, IC 374590, IC 374593, IC 374609, IC 419477 and IC 419564 along with two check varieties, Shillog and Jaihtig of perilla were planted on 20 June 2011 to raise the crop at plot size of 3.00×0.45 m in a randomized block design. Standardized package and practices were adopted to grow the healthy crop. Under field condition, days to 50% flowering, plant height (cm), number of primary branches, days to maturity, 100-seeds weight (g) and seed yield (g plant⁻¹) of perilla were recorded.

Major fatty acid composition of oil:

- Oleic acid 7.0-39.4%
- Linoleic acid 51.6-72.6%
- Linolenic acid 0.9-3.0%
- Arachidic acid 0.5-2.8%
- Myristic acid 1.1-3.3%
- Palmitic acid 5.0-12.4%
- Stearic acid 2.3-11.6%

(Source: Hilditch)

Perilla seeds have about 50% fats and 30% volatile oil. The fats of perilla seed are comprised of about 60% ALA (typical range is 55-64%), an omega-3 fatty acid, along with about 15% linoleic acid (omega-6) and 13% oleic acid (omega-9); the seed oil also contain about 4-6% glycolipids and 2-3% phospholipids (Yu *et al.*, 1997).

RESULTS AND DISCUSSION

Results revealed that different genotypes of perilla had wide variation with respect to flowering, maturity, plant growth and seed characters. Among the genotypes variations in days taken to heading and days to maturity were considerable enough among the entries. The entry, IC 374593

Table 2: Promising lines in perilla for various characters

Characters	Promising lines
Days to 50 % flowering	IC 374593, IC 369449, IC 374590, IC 374609, IC 334313, Jaihtig
Days to maturity	IC 374593, IC 374590, IC 369449, IC 374609, IC 334313, Jaihtig
Seed yield plant ⁻¹ (g)	Jaihtig, Shillog, IC 006444, IC 419564, IC 003913, IC 374593, IC 006442

that flowered in 121.50 days, was the earliest flowering line. The maturity period of the lines showed that IC 374593 was the earliest maturing entry (172.50 days). Days taken to 50% flowering ranged from 121.50 to 146.00 days and maturity duration varied from 172.50-197.50 days, however, earliest 50% flowering and maturity was recorded for IC 374593 genotypes. Plant height varied from 74.50-99.10 cm, whereas, number of primary branches varied from 6.70-9.60 plant⁻¹ and low to moderate variation was observed for test weight ranged from 3.29-3.69 g measured as the weight of 1000 seeds showed considerable variation. However, seed yield per plant for the entries varied widely from 3.40-6.28 g plant⁻¹ the check variety Jaihtig (6.28 g plant⁻¹) was the maximum yielding entry, followed by Shillog (6.12 g plant⁻¹) The entry, IC 374609 yielded the lowest (3.40 g plant⁻¹). Considerable variations among the genotypes were also observed in pearl millet germplasm (Loumerem *et al.*, 2008) and for finger millet (Govindaraj *et al.*, 2010).

The list of promising germplasm lines for important characters has been presented in Table 2.

CONCLUSION

On the basis of maturity genotype IC 374593 had earliest entry and the maximum test weight of 1000 seeds was observed for IC 006444, whereas greatest seed yield per plant was noticed for the check variety Jaihtig. We may be concluding that there is considerable variation among the genotypes of perilla for different characters i.e., maturity, plant height, number of branches per plant, 1000-seed weight and seed yield per plant. This variation might be useful tools for selecting the suitable genotype under North-West Himalayan agri system and for further breeding programs.

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