

Seed Size, Shape and Length Breadth analysis of different Ecotypes of Kala Zeera (*Bunium persicum* Boiss.) Across Kashmir Valley

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Abstract—The study was conducted to analyze seed size, shape and length breadth of different ecotypes of *Bunium persicum* Boiss in Kashmir valley. Plant material consisted of root tubers collected during August-September 2018 from natural populations growing at four locations of Kashmir region namely, Gurez, Harwan, Charar-e-Sharief and Khrew was cultivated and studied for seed shape, size and oil content.

1. INTRODUCTION

Bunium persicum (Boiss), also known as black cumin or kala zira or shahi-zeera, belongs to family Apiaceae. The family consists of about 423 genera. The genus *Bunium* contains about 166 species, including *B. persicum*, *B. carum*, *B. bulbocastenum*, *B. elegans* and *B. cylendricum*. It is highly valued for its seeds, which are used as spice and medicinal constituents in many medications to cure a number of diseases. It is perennial, dicot, glabrous, branched herb native to Central Asia to Northern India¹, having diploid chromosomal number of $2n = 14^2$. *Bunium persicum* has been found growing in dry temperate areas in the Western Himalayan region of the Indian sub-continent at an altitude between 2000–3000m above mean sea level and extending up to Baluchistan and Afghanistan³. High altitude regions of Kinnaur, Lahul Spiti, Pangi, and Bharmaur of Chamba area in Himachal Pradesh, Paddar valley, Gurez and Drass areas of Jammu & Kashmir are the potential areas of its production in India⁴. In Jammu and Kashmir, the crop species grows mostly in the wild under natural conditions in forests on open hilly grassy slopes, low alpine and table lands mostly across the areas of Gurez, Tulail, Keran, Machil, Tangdar, Kargil, Paddar Kishtwar, Khrew and Charar-e-Sharief. The plant is initially propagated through seed and subsequent regeneration is possible through tubers. The planting of seeds and tubers in October and November (just before snowfall) was found to be appropriate, however, seed sown immediately after melting of snow did germinate, but the percentage of survival is very less as compared to the seeds sown before winters. It blooms

during April-May. Fully developed plants are branched, 40-80 cm high, bearing umbel inflorescence and white flowers. The other distinctive feature of the family is its fruit, schizocarp consisting of two mericarps. The fruit are slender, dark brown in color, and crescent shape. The pollination is accomplished through insects. The above ground biomass of the plant can be pulled up easily on maturity, leaving the tuber underground. The tuber after harvesting of crop in June-July remain dormant till March-April and on becoming active, the next cycle of vegetative and reproductive phase is completed in the following 3-4 months. The tuber possesses a productive span of at least 10-12 years, once planted, the crop remains in the field for quite a number of years, yielding good returns every year. The tuber weighing an average of 1.50 g with 2.5 cm diameter gives flower in the same year of planting. It requires an average rainfall of 38-64 cm, very cool period with freezing temperature and snowfall during the winter when tubers are dormant. Heavy snowfall during the winter months is most essential for its maximum yield. The plant requires an optimum temperature of 24-27°C and sufficient moisture in the soil⁵. Kalazeera is a low volume high value, non-perishable commodity. Its seed contains essential oil. Apart from seeds, the straw left after harvesting of seed is also a rich source of volatile oil and oleoresin. The oil is rich in cuminaldehyde and p-menthadienals, the essential oils extracted from seeds are reported to have noteworthy antioxidative, antibacterial and antifungal activities⁶. The seeds of *B. persicum* are mainly used as a carminative and spice in food industry for flavoring purposes. Seeds are reported to have stimulant, expectorant, antispasmodic and diuretic properties. Moreover, seeds are frequently used in treating diarrhea, dyspepsia, fever, flatulence, stomachic and numerous other diseases⁷. Its aromatic seeds are also locally/commercially used as a spice to add flavor to the dishes, delicacies and bakery, besides being used in the preparation of many ayurvedic medicines. The seeds of *Bunium persicum* are sold in market at the rupees 700 to 1500 per kg. Besides, its high commercial utility it remained overlooked and neglected for its cultivation

practices. Although some efforts have been done in the recent years to domesticate it in certain areas of Gurez, Harwan-Dara, Wasturwan-Tral, Charisharief, and Khrew but due to non-availability of suitable genotypes, cultivation remained very limited. However, collectively wild and cultivated resources of *B. persicum* at present are not enough to meet the requirements of its different end users. Therefore, this crop needs much more attention at present for its sustainable exploitation by the farmers and improvement through scientific methods. Thus, the current situation demands the development of scientific and sustainable approaches to be followed by growers to increase the production and to conserve the diverse resources of this plant species

2. MATERIAL AND METHODS

The present study was done to analyze the seed size, shape and length breadth ratio in *Bunium persicum* across different ecotypes of Kashmir valley. Plant material consisted of root tubers collected during September 2018 from natural populations growing at four locations of Kashmir region namely, Gurez, Harwan, Charar-e-Sharief and Khrew. Tubers collected from various sites were weighed and planted in experimental plots. Tubers were weighed with digital Vernier Caliper. The spacing from row to row was maintained 16 cm and from plant to plant 10 cm. Each plot was planted with 20 tubers. The design for the experiment was completely random. Planting of tubers, recommended dose of N, P and K in the ratio of 30:40:20 along with farm yard manure were mixed with soil at the time of land preparation. Before planting, the tubers were subjected to fungicidal treatment with 0.2 per cent carbendazim for 10 minutes and latter with 0.03 per cent myclobutanil for 30 minutes. All agronomic measures were adopted for raising and maintaining a healthy crop. Randomly selected plants from each ecotype were studied with respect seed size, shape and length breadth (L/B) ratio. Average seed length and breadth (mm) was measured from twenty five seeds from each ecotype with digital Vernier.

3. RESULTS

Seed length

It was evident that the seed length ranged from 2.9 mm to 3.8 mm. Maximum length was observed for seeds of Charar-e-Sharief ecotype (3.8mm), while as the minimum value was observed for Gurez ecotypes (2.9mm). Seed length of Khrew (3.4 mm) and Harwan (3.3 mm) ecotypes was statistically at par with each other.

Seed breadth

It was observed that seed breadth ranged from a lowest 0.78 mm to the highest 1 mm. The maximum breadth was observed in Charar-e-Sharief ecotype (1 mm) and the minimum was for Gurez (0.78mm). Khrew (0.91 mm), Harwan (0.90 mm) ecotypes were having significantly narrower seeds than Charar-e-Sharief but broader than Gurez ecotypes.

L/B ratio (Seed shape)

L/B ratio of different seed samples ranged from 3.66 to 3.8. The highest value of 3.8 was observed for Charar-e-Sharief ecotype which was closely followed by Khrew (3.73), Gurez (3.71) showing that seeds of these ecotypes were more slender. The lowest L/B ratio was observed for Harwan (3.66) indicating that their seeds were comparatively less slender in shape than other ecotypes.

4. DISCUSSION

The most important thing related any plant is the final yield, similarly seed yield is significant in case of kala zeera. Thus it is also cardinal to select the better ecotypes of *Bunium persicum* (Boiss.) under temperate agro climatic conditions of Kashmir valley which can provide better results. An overall glance depicting performance of ecotypes, revealed that Charar-e-Sharief, Khrew, Harwan types have longer seeds, whereas Gurez types have shorter seeds. On the basis of the seed breadth, Charar-e-Sharief ecotype comprised broader seeds, followed by Khrew and Harwan ecotypes. Gurez ecotypes had narrow seeds. In order to get a clear idea about the seed size and shape, L/B ratio were calculated. L/B ratio of different seed samples ranged from 3.66 to 3.8. The highest value of 3.8 was observed for Charar-e-Sharief ecotype which was closely followed by Khrew (3.73), Gurez (3.71) showing that seeds of these ecotypes were more slender. The lowest L/B ratio was observed for Harwan (3.66) indicating that their seeds were comparatively less slender in shape than other ecotypes.

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