

## Biodiversity of kale (*Brassica oleracea* var. *acephala* L.) in Kashmir Valley

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### ABSTRACT

Forty diverse genotypes of kale were collected from various parts of the Kashmir valley and evaluated during *Rabi* 2004 at three locations, for generating descriptors as an effort to conserve valuable genetic resources of the crop besides documentation. The estimates of range and mean indicated existence of tremendous variability for all the characters under study. Number of leaves was the most variable character with a range of 13.82 to 110.76 leaves per plant followed by plant height with a range of 8.89 to 56.74 cm on the basis of data pooled over environments. The data revealed that the genotypes collected differed significantly from one another, however, classificatory technique when applied broadly classified them in to various groups *viz.*, curly group, ornamental group, perennial group, collard group and tall groups.

**Key words :** Kales, Biodiversity, Kashmir valley, Descriptors, Evaluation, Germplasm

**K**ale (*Brassica oleracea* var. *acephala* L.) belongs to the family cruciferae. Kales are probably the first brassicas to be cultivated and are quite similar to wild cabbage. It is a highly nutritious vegetable, rich in vitamins particularly vitamin C, pro-vitamin A and minerals such as calcium, phosphorus, potassium, magnesium, iron etc. It is reported to have highest concentrations of total antioxidants (Cao *et al.*, 1996). Amongst the leafy vegetables kale (*Brassica oleracea* var. *acephala* L.) is cultivated on a large scale in the temperate regions of the country. In India kale has not been grown as a vegetable crop for commercial use. However, it is commercially grown in Kashmir and to a limited extent in Jammu, Assam and Himachal Pradesh. In Jammu and Kashmir it is a popular vegetable both among rich and poor and grown in almost all kitchen gardens and also as a commercial crop around cities and towns. Kales grown in Kashmir are popularly known as "HAK". The Sanskrit nomenclature for all edible green leaves "SHAK" appears to have gradually changed in present day local nomenclature as "SAG" in most parts of the country and "HAK" in Kashmir (Wanchoo, 2000). Kales are highly cross pollinated and show tremendous variability for most of the characters. Genetic variability existing and created in both the cultivated and wild species either through natural processes or through crop breeding is essential for generating new gene complexes for realizing higher economic yield and resistance to biotic and abiotic stresses. It is a unique crop which supplements the food needs of the valley both during summer and winter making the crop as one of the most widely grown crop. A discussion on the plant genetic resources of kale

(*Brassica oleracea* var. *acephala* L.) in Kashmir can generate a way to minimize the shrinking bio diversity. Inventorization and documentation of the crop is a pre requisite for long term conservation and planned breeding programme.

### MATERIALS AND METHODS

Forty diverse genotypes of kale were collected from various parts of the Kashmir valley and evaluated during *Rabi* 2004 at three locations *viz.*, Experimental fields of the Division of Olericulture, SKUAST, Shalimar Srinagar, FoA, SKUAST, Wadoora, Sopore, Baramulla and High Altitude Rice Research Sub-station, Larnoo, SKUAST Anantnag. The experimental plot consisted of 3 rows of each genotype in each replication at spacing of 20 x 30 cm. The experimental fields were well prepared and standard recommended package of practices were followed to raise a good crop. Descriptors for each genotype were generated as an effort to conserve valuable genetic resources of the crop besides documentation. The present article on the native genetic resource (Khanyari Hak, Kawdari Hak, Hanz Hak, Wantipori Hak, Jumadari Hak, Anchari Hak and Koker Hak and Pumb Hak) of kale focuses mainly the traditional varieties that are being grown in this region with the exceptionally good yield, quality and disease resistance traits that has suited through ages to the local consumers. This article / contribution will serve as an important research documentation and fulfill the long felt need to have the current status of native genetic diversity of kales in Kashmir.

## RESULTS AND DISCUSSION

The data pertaining to evaluation of the genotypes for various morphological traits, descriptors and quality parameters are presented in Table 1. The estimates of range and mean indicated existence of tremendous variability for all the characters under study. Number of leaves was the most variable character with a range of 13.82 to 110.76 leaves per plant followed by plant height with a range of 8.89 to 56.74 cm on the basis of data pooled over environments. The data revealed that the genotypes collected differed significantly from one another; however, classificatory technique when applied broadly classified them in to various groups viz., curly group (SH- K-1, SH- K-2, SH- K-3 and SH- K-4), ornamental group (SH- K-5, SH- K-6, SH- K-7, SH- K-8, SH- K-9 and SH- K-10), perennial group (SH- K-11, SH- K-12, SH- K-13, SH- K-14, SH- K-15 and SH- K-16), collard group (SH- K-17, SH- K-18, SH- K-19, SH- K-20, SH- K-21, Jumadari, SH- K-23, SH- K-24, SH- K-25, SH- K-35, SH- K-38 and SH- K-39) and tall group (Khanyari, SH- K-27, SH- K-28, SH- K-29, SH- K-30, Kawadari, SH- K-32, SH- K-33, SH- K-34, SH- K-36, SH- K-37 and SH- K-40). The full description of the germplasm is given in tabulated form (Table 2).

**Table 1 : Mean performance of kale (*Brassica oleracea* var. *acephala* L.) genotypes for yield and yield attributing traits in pooled over environments**

Traits	Pooled over environments	
	Range	Mean
Plant height (cm)	8.89-56.74	36.81
Plant spread (cm)	31.99-55.89	46.58
Leaf thickness (mm)	00.13-00.47	00.31
Stem thickness (cm)	00.88-06.37	02.98
No. of leaves plant <sup>-1</sup>	13.82-110.76	26.24
Av. leaf weight plant <sup>-1</sup>	08.12-20.93	13.52
No. of pickings plant <sup>-1</sup>	03.40-14.73	06.63
Leaf yield plant <sup>-1</sup> (g)	160.52-903.22	324.20
Leaf yield plot <sup>-1</sup> (kg)	02.89-16.26	05.84
Leaf yield ha <sup>-1</sup> (q)	267.53-1505.32	540.33
Leaf length (cm)	15.14-34.37	25.18
Lamina length (cm)	11.57-18.56	15.38
Leaf breadth (cm)	08.49-16.28	13.55
Leaf size (cm <sup>2</sup> )	105.57-278.02	209.29
Av. stalk weight (g)	01.08-05.64	02.72
Av. mid rib weight (g)	00.36-02.98	01.54
Blade: mid rib ratio	04.95-19.97	08.24
Leaf: stalk ratio	03.52-07.95	05.52
Days to first leaf picking	12.29-30.38	19.48
Duration of picking	102.62-120.71	113.52

**Table 2 : Grouping of kale germplasm (*Brassica oleracea* var. *acephala* L.) on the basis of important economic traits and suitability of growing season**

Sr. No.	Groups	Genotypes	Brief description
1.	Curly group	SH- K-1, SH- K-2, SH- K-3, SH- K-4	Plants sufficiently hardy to with stand frost and snow, stout with spreading habit, height of the plants varies from 9 to 15 cm, leaves dark green, lobed and somewhat crowded around the stem, leaves have a dense appearance owing to the frilly or wavy edges in the blade of the leaf which gives the appearance of a glorified garnishing parsley, leaf stalk long and thick, midribs thick, veins prominent, thick and whitish green in colour
2.	Ornamental group	SH- K-5, SH- K-6, SH- K-7, SH- K-8, SH- K-9, SH- K-10,	The group of selections/ genotypes comprises plants of spreading habit with decorative leaves that are of various colours viz., purple, green and greenish white, leaf blade mostly entire with frilly margins, thick, foliage used for garnishing and also makes excellent food, colour of leaves disappear on cooking and the leaves become appetizingly good, some strains make large plants often 2-3ft. high, shoots succulent, stalks and midribs of average weight, veins prominent and thick
3.	Perennial group	SH- K-11, SH- K-12, SH- K-13, SH- K-14, SH- K-15, SH- K-16,	Large growing types with a vigorous and bushy habit, main leaves large, almost oblong in shape, margins of the leaves are slightly serrated but not usually wavy, green, quality not good as compared to other kales, extremely hardy, produce dense head of foliage in winter and then abundant delicious young shoots in summer. Stems stout and woody, stalks and midribs of very thin and of less weight, veins are prominent but not thick
4.	Collard group	SH- K-17, SH- K-18, SH- K-19, SH- K-20, SH- K-21, Jumadari, SH- K-23, SH- K-24, SH- K-25, SH- K-35, SH- K-38, SH- K-39,	A type of kale group that with stands the most rigorous weather conditions, leaves dark green, thick, fairly lobed with large stalks and produced around the main stem which is generally reduced, such types are shy for picking and are generally sold as whole plants in bundles, stem stout and either purple or green, leaf stalks and mid ribs are stout and thick, plants resemble knol khol with comparatively small knob, plants are of medium height, spreading, such types when resorted to picking result in the elongation of knob which finally assumes a conical shape

Contd.....2

Table 2 contd....

5. Tall group	Khanyari, SH- K-27, SH- K-28, SH- K-29, SH- K-30, Kawadari SH- K-32, SH- K-33 SH- K-34, SH- K-36, SH- K-37, SH- K-40	The varieties/selections in this group differ from the other groups in that they attain a considerable height of 60-70 cm and are prone to lodging at the later stages. The individual leaves are the simplest in the kale series and are for the most part flat, large and puckered, there are practically no waved margins, colour of the leaves varies from green to bluish green having small stalks and margins, leaves succulent and early in picking, puckering is considered as a sign of quality and are usually preferred stalks and midribs small usually whitish green in colour, such kales are susceptible to frosts and therefore have been designated as summer types, such class of varieties are admirable for a small garden because it can be close planted and a large quantity of produce can be grown on a small area. Such varieties are detopped for seed production purposes and for getting abundantly young shoots in summer before start of reproductive phase and the sold in the name of "Kanul" when practically no kales are available in the market and fetch remunerative prices
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