Original Research Article

Seed Production of Knolkhol (Brassica oleracea var. Gongylodes) under Mid Hills of Jammu & Kashmir, India

Anil Bhushan*, Satesh Kumar, Susheel Sharma, Vikas Sharma, Manoj Kumar and Kamlesh Bali

Regional Agricultural Research Station, Rajouri, SKUAST-Jammu-185131, India

*Corresponding author

A B S T R A C T

Knolkhol (Brassica oleracea var. Gongylodes L.) is one of the important cruciferous vegetable crops of mid hills of Jammu & Kashmir. It is a short duration crop, biennial showing seed maturiy in the month of April-May. Its maturity coincides with the sowing of maize crop which is the main staple crop of the region. To enable the farmers to go for knolkhol seed production, a two year field experiment was conducted at Regional Agricultural Research Station, Rajouri, SKUAST-Jammu during 2011-12 and 2012-13. Two methods viz., in-situ and replanting methods of knolkhol seed production were laid out and all the growth, seed yield and crop duration parameters were recorded for comparative studies. Results clearly pointed out that that in situ method, seed was produced in the month of March, whereas in replanting method, the seed was produced in the month of April. Moreover, high seed yield per plant and test weight was recorded in in situ method. Thus, it can be concluded that in situ method of knolkhol seed production may be recommended to the farmers of mid hills of Jammu & Kashmir.

Keywords
Knolkhol, Seed production, Mid hills

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Introduction

Knolkhol (Brassica oleracea var. Gongylodes L.) is one of the important cruciferous vegetable crops of state of Jammu & Kashmir, India. It is mainly a cool season crop but grows well even throughout the year. It is traditionally grown extensively in Kashmir valley. However, over a period of time its popularity and acceptability has increased manifold across Jammu region of the state also. Due to this reason its cultivation has extended to all the nooks and corners of the state. In Jammu province, it is cultivated in 2712ha area with production of 55118 MT (Anonymous, 2017). There is a tremendous scope of knolkhol production in Jammu region particularly in the Mid hills of
Jammu and Kashmir due to highly favourable climatic conditions with mild agroclimates suited for its cultivation as well as seed production (Bhushan et al., 2010). Besides being preferred for its long tender leaves, fleshy enlarged stem formed just above ground commonly known as knob, is the edible portion and is used as cooked vegetable at tender age and for pickle purpose when the knobs become fibrous. The modified stem (knob) of knol khol is fairly rich in carbohydrates, proteins, vitamin C and important minerals like calcium, phosphorous, potassium and sodium (Banu Shalini et al., 2002).

The importance of quality seed which is able to produce the desired crop is well known. In this direction, method of seed production also plays a key role to guarantee the desired crop performance and economic returns to the farmers. There are two methods of seed production in knol khol viz., in situ (seed to seed method) and replanting (knob to seed method). While the former method is mainly followed for commercial seed production, the later method is followed for nucleus or breeder seed production (Singh et al., 1959). For quality seed production in cole crops it requires low temperature (vernalization) for change of vegetative stage to reproductive stage (Verma and Sharma, 2000). Knol khol is sensitive to bolting known as premature bolting which is common problem in seed crop. The duration of vernalization period also effects bolting and it has been established that the vernalization effect decreases when this period lasts longer than a certain number of days (Verma and Sharma, 2000). However, seed production is mainly done in winter months only in plains as well as in hills. The agro-climate of Jammu region is quite suitable for seed production of knol khol. However, its maturity coincides with the sowing of maize crop which is the main staple crop of the region. To enable the farmers to go for knol khol seed production, a two year field experiment was carried out under mid hill conditions of Jammu & Kashmir.

Materials and Methods

Location and climate

A two year field experiment was carried out during Rabi season of the year 2011-12 and 2012-13 at Experimental Farm of Regional Agricultural Research Station, Rajouri, SKUAST-Jammu. The experimental farm is situated at 32.52° N latitude and 74.01° E longitude at an elevation of 958 m above mean sea level. The place experiences hot dry summers, humid rainy season and extended winter season. The topography of the place is predominantly hilly and undulating. The soil of the experimental field was clayey in texture with 196.5 kg/ha available N, 8.1 kg/ha P₂O₅, 124 kg/ha available K₂O and having a pH of 7.67. The knol khol variety ‘G-40’ developed by SKUAST-Jammu, having ability to produce seeds under diverse agroclimates ranging from subtropical plains to mid and high hills of Jammu and Kashmir was used for experimentation.

Nursery raising

Seeds were sown in the 1st week of September on the raised nursery beds (3m x 1m size) in lines 5cm apart. Healthy seedlings were ready for transplanting after 4 weeks of sowing. Seedlings were transplanted on 1st week of October during both the years.

Crop raising

Three ploughings were done to bring the field into fine tilth and well rotten farm yard manure (FYM) @ 20t/ha was incorporated 15 days before actual transplanting and rest of inorganic fertilizers were applied at the rate of 100 kg N, 50 kg P₂O₅ and 50 kg MOP as per
the recommendations in package of practices
of vegetables crops (Anonymous,2018). 1/3\textsuperscript{rd}
dose of N and full doses of P\textsubscript{2}O\textsubscript{5} and MOP
were applied as basal dose. Remaining 2/3\textsuperscript{rd}
of N was top dressed in two equal amounts
after 30 and 45 days of transplanting. An
additional dose of 50 kg N, 50 kg P\textsubscript{2}O\textsubscript{5} and 50
kg MOP with crop, whereas as given to the \textit{in situ} crop. All the other intercultural operations
were carried out as per recommended in the
package of practices.

\textbf{Seed production methods}

To check relative efficiency for quality seed
production of the knolkhol, two methods
viz.,in-situ and replanting method were tested.

\textbf{In situ method}

Healthy, uniform true to type plants were
selected from the main field and were allowed
to grow, overwinter and produce seed in the
field itself.

\textbf{Replanting method}

A separate field was selected where the
selected knobs were replanted in the pits of
1x1 feet size, dug at the spacing of 1 meter
apart. Pits were filled with well rotten FYM
and N P K and selected plants were replanted
in the last week of November. During
replanting, all the leaves except crown leaves,
were removed and lifted with mud ball
carefully without disturbing the root zone. All
the necessary plant protection measures were
taken from time to time to ward off any
chance of diseases and pests. Data from both
the methods was recorded for various plant
and seed traits viz., plant height (cm), number
of branches, days to 50% flowering, crop
duration, number of siliqua per plant, length
of siliqua (cm), number of seeds per siliqua,
100 seed weight (mg) and seed yield per plant
(g) during the experimentation and
comparison was done from average data of
both the years.

\textbf{Results and Discussion}

From the perusal of results reflected in Table
1, it was revealed that maximum plant height
(134.6cm) and number of branches (14.0) was
recorded in \textit{in situ} method which was 31.2cm
and 2.2 higher than replanting method
(103.4cm and 11.8). The plants also showed
50 percent flowering after 131 days of
transplanting which was 22.9 days earlier than
replanting method (156.0 days). The seed
crop raised through \textit{in situ} method took 175
days to mature which was 22.0 days earlier
than replanting method (197 days). Earliness
in the seed maturity under \textit{in situ} method was
crucial to the farmers of mid hill region of
J&K to go for timely maize planting. Similar
results were obtained by Kaki,2010 in
knolkhol under Jammu subtropical plains.

Higher average seed yield per plant was also
recorded in \textit{in situ} method with 54.8 g which
was 17.1 g more than replanting method (37.7
g). The increased seed yield in \textit{in situ} method
can be attributed to high values of seed yield
contributing parameters. Maximum number of
siliqua per plant, siliqua length and number of
seeds per siliqua (305.2, 7.3cm and 19.8
respectively) was recorded in \textit{in situ} method
as compared to replanting method (257.9,
6.4cm and 14.8 respectively) (Table 1, Fig 1). The
obvious reason for high seed parameters
\textit{in situ} method might be due to fact that in
replanting method the plant was subjected to
transplanting shock and also took additional
days for re-establishment. Similar results
were obtained by Kaki,2010 in knolkhol
under Jammu subtropical plains and Mohanty
and Srivastava, 2002 in cauliflower.

Quality of seed was also found better in \textit{in situ} method with high values of 1000 seed
weight (4.70g) as compared to replanting
method (3.80 g). Bold seed formation in *in situ* method can be attributed to the overall better growth contributing parameters and undisrupted life cycle of the plant. Similar findings were reported by Mohanty and Srivastava, 2002 in cauliflower.

**Table.1** Comparison of seed production methods of knol khol under mid hill conditions of Jammu & Kashmir (Data based on average of two years)

| Parameter                        | *In situ* method | Replanting method |
|----------------------------------|------------------|-------------------|
| Plant height (cm)                | 134.6            | 103.4             |
| No. of branches/plant            | 14               | 11.8              |
| Days to 50% flowering            | 131              | 156               |
| Seed crop duration               | 175              | 197               |
| No. of siliqua/plant             | 305.2            | 257.9             |
| Length of siliqua (cm)           | 7.3              | 6.4               |
| No. of seeds/siliqua             | 19.8             | 14.8              |
| 1000 seed weight (g)             | 4.70             | 3.80              |
| Seed yield/plant (g)             | 54.8             | 37.7              |

**Fig.1** Comparison of Pod size in *in situ* and replanting method

Therefore, based on the results obtained in the experiment, it can be concluded that *in situ* method, seed was produced earlier with high seed yield per plant and test weight as compared to replanting method and may be recommended to the farmers of mid hills of Jammu & Kashmir.
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