Good Practices for Production of Shalimar Saffron-1

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F OREWORD

Saffron (*Crocus sativus L.*) a perennial herb belongs to Iris family *Iridaceae* is the most expensive spice in the world known for its aroma, taste and colour used for flavouring, colouring, medicinal and pharmaceutical industries. At the global level saffron is produced by Iran, India, Spain, Greece, Italy, Morocco, Azerbaijan etc. Iran, India and Spain are the major saffron producing countries with Iran occupying the maximum area and contributing about 88% of world's saffron production. Though, India occupies the 2nd largest area but produces approximately 7 per cent of the total world production which is far less to meet out the national demand.

Saffron crop management techniques viz., planting, weeding, flower picking and separation of stigmas are mostly performed by hand all over the world. Its cultivation is generally carried out as a perennial cycle and with the ageing of the saffron field, generally after 4–5 years, saffron production declines because of increasing competition for water and nutrients, fungal infection due to overcrowding and the reduced size and reproduction capability of corms.

Research and Development initiatives in the recent past have opened up new opportunities for harnessing higher income and better livelihood for saffron farmers. The research initiatives taken by SKUAST-Kashmir have enabled development of First Global Variety of Saffron (Shalimar Saffron-1) whose dissemination to end users would yield fruitful results.

I take this opportunity to compliment authors for their dedication and efforts in bringing out this publication in the form of Good Practices for Shalimar Saffron-1. I hope this package for saffron will be highly useful to researchers, teachers, extension workers and students.

31/XI/20

(Prof. Mushtaq Ahmad)

Place: SKUAST-K, Shalimar
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Contents

Saffron is the spice derived from the flowers of the saffron plant scientifically known as *Crocus sativus* L. and its cultivation spreads across the western Mediterranean region (Spain) to India (Kashmir). Since time immemorial, stigmas of saffron have been valued for its exotic flavour, bitter taste, and colour. Saffron predominantly contains chemical constituents such as crocin, picrocrocin and safranal which are responsible for colour, flavour, and aroma, respectively. It is the most expensive spice of the world as its cultivation, harvesting and processing being highly labour intensive besides its qualitative worth. Low yield of this spice is attributed partly to the primitive non-scientific agronomic practices and partly to the genetically uniform planting material both of which call for immediate refinement. In order to ensure the future of the saffron crop, it is indispensable to improve cultivation techniques, planting material and quality evaluation methodology.

Origin and distribution

The origin of saffron is a little obscure with two possible sites of origin indicated i.e., one in Greece in the Mediterranean area and the other in the East in Turkey-Iran-India. Its domestication dates back to around 2000-1500 BC (Negbi, 1999). Cultivation for commercial purposes is more or less intensely done in Iran, Spain, India, Greece, Morocco, Italy, Turkey, France, Switzerland, Israel, Pakistan, Azerbaijan, China, Egypt, United Arab Emirates and Japan. Recently it has also been introduced in some non-traditional countries like Australia, New Zealand, USA, Argentina and Chile (Sharifi *et al.*, 2010). In India (Jammu & Kashmir) it was introduced by Persians around 500 BC (Singh and Dhar, 1976; McGee, 2004) and cultivated in Pulwama, Budgam, Srinagar, Doda, Kishtwar and Ananatnag. The limit of entire genus lies within the range of longitude 10 °W and 80 °E, and latitude of 30 °N and 50 °S. It grows well at 650 m amsl in Greece and 1200-1300 m

amsl in India (Jammu & Kashmir). Most probable descendents of *C. sativus* L. were *C. cartwrightianus* Herb. or *C. thomasii* Ten. (Mathew, 1982). Both these species are diploid with a karyotype similar to saffron but the DNA content of *C. cartwrightianus* was more similar to *C. sativus* as compared to *C. thomasii*. Cytoflourimetry, reproductive biology, cytology and cytogenetics (Grilli Caiola and Canini, 2010) also signifies *C. cartwrightianus* as an ancestor of *C. sativus*. Lack of reproductive barriers may have resulted in the origin of saffron through fertilization of a normal reduced egg cell with an unreduced male gamete of the same Crocus species or by crossing between an egg cell and the male unreduced gamete of another species.

World scenario of saffron production

The production of saffron is quite expensive due to labour intensive planting, flower harvesting and separation of the stigmas. Around 1,50,000-1,60,000 flowers and over 400 hours of hand labour are required to produce 1.0 kg of dry saffron (Fernandez, 2004). Saffron is mainly produced in Iran, India and Greece contributing 96.3 per cent of area and 94.9 percent of production. Italy has a small area but maximum productivity of 8.16 kg/ha. Iran is a major player in area, production and export of saffron. The current area and production of Iran has crossed 105000 ha and 336 t, respectively, accounting for about 88.8% of world production (Ministry of Jahad of Agriculture, 2017). In India saffron is mainly cultivated in Jammu and Kashmir and the total area under this crop in Kashmir has reached to 3715 ha registering an increase of 50.8% since 2004. The reversal of decreasing trends of saffron could be attributed to strong research and development efforts made by SKUAST-Kashmir and Department of Agriculture (J&K). These efforts lead to the increase in saffron productivity from 2.5 kg/hectare in 2003-04 to around 5.0 -5.5 kg/hectare during last few years (Fig.1).

In J&K state currently over sixteen thousand families spread over 226 villages are engaged in saffron farming, not only for decent livelihood but as a family profession as well. Keeping in view the importance of saffron industry for overall growth and future of large number of farmers working with Saffron, the SKUAST-Kashmir initiated varietal development programme of saffron during 2010-11 which resulted in development of a Composite Saffron Variety namely Shalimar saffron-1 and is the first Global variety in Saffron.

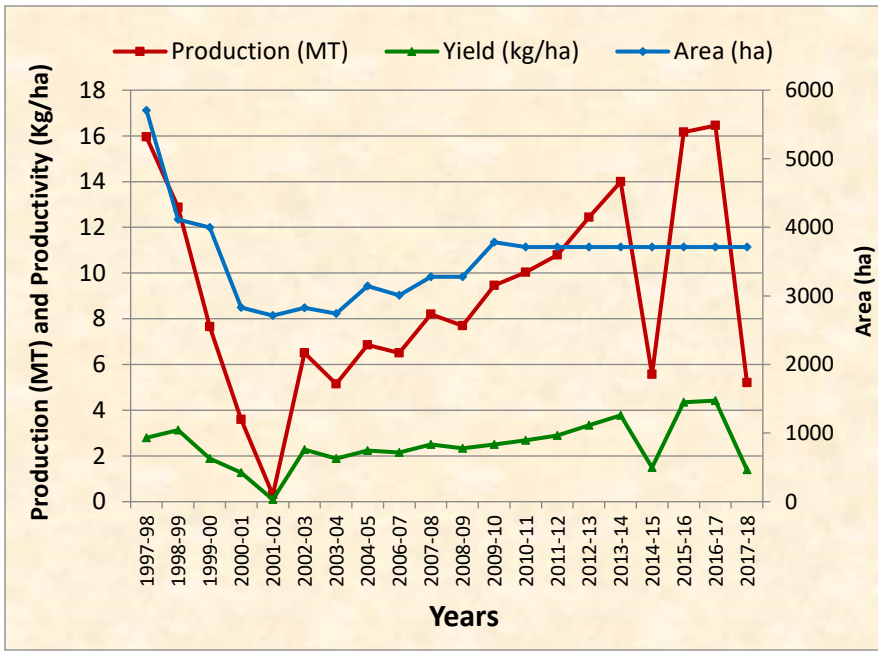


Fig. 1: Trends in Area, Production and Productivity of Saffron in Jammu & Kashmir

Description of Shalimar Saffron-1 (SD 1-13)

Mutation breeding approach followed by selection has facilitated development of a composite variety Shalimar Saffron-1. Corms of Shalimar Saffron-1 are identical to gladiolus corm with respect to visual appearance. The shape of the corm varies from flattened to ovoid or sub-globose. Newly formed corm has 1 or 2 apical buds from which new

leaves, floral axis and 3 or 4 daughter corms are produced and 4 to 7 secondary buds, placed irregularly in a spiral form in the lower portion. Its roots are adventitious, growing from the bottom of the corm, leaves

are radical, long, slender grass like, channeled, with curved and fringed margins; they are grey green in colour, each corm has tendency to produces 7–18 leaves with 1–3 flowers having three inner tepals and three outer tepals. Stigmas (final product) are extended and protrude from the perianth; they are tubular, reddish or orange red in colour and their length varies from 2.3 to 3.5 cm forming a tube narrower on the base, where it joins the style but it broadens towards the upper extremity, where a slit is on the inner side. One stigma of saffron weighs around 2.0-2.3 mg, each flower has three stigmata and to produce 1.0 kg of saffron it requires about 140000 – 145000 flowers. . The variety is suitable for high density plantation

and is superior for yield and quality attributes conforming high value for big corm index, low flower raising index, high saffron yield and high values of picrocrocin, saffranal and crocin.

Cultivation Practices for Shalimar Saffron-1

Soil and Climate

Saffron grows best in friable, loose, low-density and well-drained clay, calcareous soils having high organic content. Alkaline soil is supposed to be desirable for giving better stand of the crop. The saffron growing soils of Kashmir possessing somewhat high colour value are more alkaline and markedly higher in alkaline earth carbohydrates than those of adjacent non-saffron growing areas. Temperature is the most important environmental factor controlling growth and flowering in *Crocus* species. The influence of a constant temperature regime on flower formation of saffron is quite important. Unusual low temperature coupled with high humidity during the short period of flowering adversely affects flower production. Optimum temperature for flower initiation and development of the corms falls in the range of 23–27°C with 23°C being marginally better for formation of maximum number of flowers. Incubation at these temperatures should exceed 50 days, although incubation longer than 150 days resulted in flower abortion. Flower emergence requires the transfer of the corms from the conditions of flower formation to a markedly lower temperature, i.e., 17°C. Transfer of the corms after flower initiation at a temperature lower than 15–17°C results in a reduction in flower formation. Weather conditions especially in November- December has greater effect on corm yield in the subsequent season. The temperate region of J&K, India, where the day temperature remains between 12–18°C and night temperatures between 4–5°C during the months of September to October is ideal for its cultivation. Cloud cover overnight encourages

maximum production of flowers in the following morning. Rainfall or irrigation during August to September is helpful in boosting early flowering for higher production.

Land preparation

Scientific preparation of land is necessary to create friable and loose texture for saffron cultivation. The field is ploughed 4–5 times to a depth of 30 – 35 cm to bring the soil into fine tilth. This is followed by a planking and leveling as needed. The field should be cleared off from all the weed growth, penetrating roots, and stubble stones. For ease in weeding, hoeing and irrigation, raised beds of convenient size preferably of 1.5 – 2.0 m width and 20–25 cm height with desired length preferably 5 m should be made. Paths may be made 25- 30 cm wide in between the beds, which also act as drainage channels during rainy season. This prevents undesirable high moisture content in the top 15–20 cm of the beds and ensures hygiene with respect to corm rot incidence.

Planting time

Strong emphasis should be laid on timely planting of corms. Delay in planting of corms results in poor establishment of corms and subsequent low flower yield during 1st year of planting. It is desirable to complete planting operation from 15th to 30th of July. Placement and position of the corms at proper depth ensures better flower and corm yields as corm continues to remain undisturbed in the soil for prescribed crop cycle period. Hand dropping after plough once

practiced by farmers would place corms at an undesired depth and in

wrong orientation. Therefore, hand sowing of corms is a good practice as sowing at proper depth of 15 cm not only ensures good flowering in the first year itself but also favours contractile root formation that favours better daughter corm formation.

Corm rate and plant geometry

For sowing of Shalimar Saffron-1 in one hectare of land under high density with a target plant population of 12 lac corms/ha, 86.4 quintals of mixed grade corms are required. The proportion of corms weighing above 8 g to the tune of 57.6 quintal (7.20 lac corms) and proportion of corms weighing 4-8 g to the extent of 28.8 quintals (4.80 lac corms) are required. 15x10 cm^2 ditches (24 ditches/m^2) all around one hectare of land are dug in rows with inter ditch to ditch distance of 25 cm and intra ditch to ditch distance of 15 cm (Center to center of each ditch). In each ditch 5 corms are planted with 3 bigger corms (>8 g) and 2 smaller corms (4-8 g) in alternate position with centre of ditch occupied by

bigger corm. For sowing 1 kanal (500 m^2) of land 12,000 ditches are dug accommodating 4.32 quintals of mixed grade corms with a proportion of 2.88 quintals of above 8 g and 1.44 quintals of 4-8 g corms.

Corm treatment

To protect the saffron from major corm and soil borne diseases, dip the corms before sowing for 5-10 minutes in fungicidal solution prepared by dissolving (0.1%) Carbendazime 50 WP and Mancozeb (0.3%) in 100 liters of water. The saffron corms are taken out and spread on a clean cloth and then allowed to dry in shade for another 10 to 15 minutes to drain off excess moisture before sowing.

Nutrient management

Shalimar Saffron-1 is highly responsive to nutrients applied either through organic or inorganic sources. Application of nutrients depends mainly on soil nutrient status/balance and cropping system. For cost

effective higher returns, the doses of applied nutrients should be matched with the soil profile properties and plant demand *per se*. However, in the absence of soil test following fertilizer schedule may be adopted. In general, apply compost or well rotten FYM uniformly at the time of first ploughing @ 15 t/ha. This is essential for increasing water retaining capacity of the soil.

To maintain soil health under high density plantation and to ensure excellent crop growth, requirement in terms of manures and fertilizers is more than normal density plantation. Following schedule is to be followed:

Inorganic fertilizers=N: P2O5: K2O 120: 90:80 kg/ha

i) Nitrogen in the form of Urea @ 186 kg/ha
ii) Phosphorous in the form of DAP @ 195 kg/ha
iii) Potassium in the form of MOP @ 133 kg/ha

Manures

i) Well decomposed farm yard manure @ 15 tons/ha (7.5 quintals /kanal)
ii) Vermicompost @ 10 quintal/ha (50 kg/kanal)

In fresh planting all inorganic fertilizers and manures should be applied during land preparation as a single supplement except for Nitrogen that should be applied in three equal split doses. After disc plough well rotten Farm Yard Manure should be applied and mixed thoroughly. Before final, ploughing with cultivator chemical fertilizers and organic manures in the form of

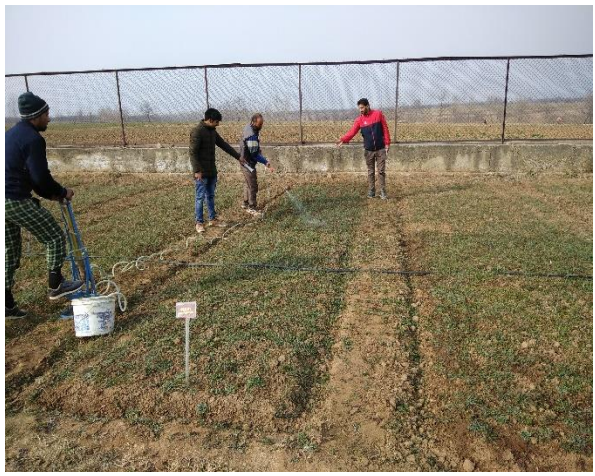
1/3rd urea and full dose of DAP, MOP and vermicompost should be applied and mixed well with the soil. Remaining Nitrogen should be applied as band placement in December and February when moisture is available.

Recommended nutrient conversion in amount of fertilizers

Fertilizers	High density saffron		Normal density saffron	
As basal application	**For one ha. area**	**For one kanal area**	**For one ha. area**	**For one kanal area**
Urea	62 kg	3.1 kg	48 kg	2.4 kg
DAP	195 kg	9.7 kg	132 kg	6.6 kg
MOP	133 kg	6.6 kg	83 kg	4.2 kg
1st top dose of urea in Dec.	62 kg	3.1 kg	48 kg	2.4 kg
2nd top dose of urea in Feb.	62 kg	3.1 kg	48 kg	2.4 kg

Weeding and Hoeing

Weeds pose serious problem in saffron because it is a slow and low-growing crop; therefore, it faces a severe infestation from large number of weeds, particularly in recapitulation stage from November to April.



Weeds compete with saffron for nutrients during crop growth and causes flower and corm yield losses to the tune of 30%. Therefore, timely intercultural practices are needed for achieving higher yield. Hand weeding needs to be practices during recapitulation stage

from December to April. Application of Nitrogen during this stage should be followed by light hoeing for proper mixing of Nitrogen in the soil. To facilitate soil aeration during dormancy 1st hoeing should be practiced in the second fortnight of June. Mechanical hoeing should be preferred over manual hoeing to reduce input cost from about Rs 60,000 to Rs 6000/ha. June hoeing should be avoided in case of excess soil moisture as hoeing under moist conditions will facilitates corm rot appearance and encourage soil compaction. 2nd hoeing should be practiced in August and soil should be developed to a fine tilth to ensure emergence of sprouts.

Metribuzin being a selective herbicide in saffron checks the emergence of most prevalent saffron associated weeds. Application of metribuzin in December followed by metribuzin in February @ 560 g/ha diluted in 300-350 litres of water is recommended for control of spring weeds in saffron.

Irrigation

Saffron is sensitive to water particularly during active stags of crop growth viz., August to November. Irrigation schedule based on 5 irrigations (700m^3 = 70mm) @ 140m^3/ irrigation starting from 1st September to 10th October and 10th November to 30th November has been standardized for Shalimar saffron-1. Water requirement is in addition to 131 mm (1310 m^3) available to saffron through rains during August to November, confirming total water

requirement of 201 mm (2010 m^3) for Shalimar saffron-1 (Table-1).

Table 2: Irrigation Schedule for Shalimar Saffron-1

(Evapo-transpiration and other system losses are taken into consideration while following the schedule)

Cycle	Date of Irrigation	Quantity of water (m^3/ha)	Interval (Days)
A) Sprouting			
First	1st Sep. to 15th Sep.	140	15 days
Second	16th Sep. to 30th Sep.	140	
Total (A)		**280**	
B) Pre Flowering			
Third	1st Oct. to 10th Oct.	140	
Total (B)		**140**	
C) Post Flowering			
Fourth	10th Nov. to 20th Nov.	140	
Fifth	21th Nov. to 30th Nov.	140	
Total (C)		**280**	
Total (A+B+C)		**700**	

Disease management

Shalimar Saffron-1 is moderately resistant to corm rot and leaf blight diseases. However, in case of disease symptom appearance, apply following plant protection measures

i. Corm rot of saffron caused by *Fusarium* spp. can be managed by drenching Carbendezium 12% + Mencozeb 63% WP @ 50 grams per 100 liters of water.
ii. Leaf blight caused by Stemphyllum sp. can be managed by applying foliar spray of Zineb 68% + Hexaconazole 4% 72 WP @ 50 grams in 100 liters of water.


Rodent Management

Rodent management is a very complicated problem. It needs a through approach to minimize the rodents menace. Before planning we should know some facts about rodents.

- ✓ It has been noticed that the rodents restrict their activity within 5-10 meter radius around the burrow.
- ✓ Methods of killing rodents are effective only when carried out on a large scale, covering large contiguous areas and are repeated time and again. The aim should be to kill more than 90 per cent of the population otherwise they breed so fast that population reaches the same level within a few months.
- ✓ The migration of rodents from one place to other is also important to born in mind while planning to manage rodent population. The cooperative efforts made by the farmers, grain handlers and administrators will not provide protection unless as a scheduled programming is done with a system approach. It should thus occupy a key position in operational plan for agricultural production and protection.

Two rodents *viz.*, Blyth's Vole, *Pitymys leucurus* and Indian crested porcupine, *Hystrix indica* are the major problem in saffron growing belts of Kashmir valley.

I. Blyth's Vole, *Pitymys leucurus* belong to Family **Muridae** is a common rodent species was found active in saffron fields.This is a small diurnal burrowing rodent species. It is active throughout vegetative phase of Saffron (Nov-April). Rodents attack vegetative primordial at the base of attachment with the corms leaving radical leaves detached, thus a complete loss to the saffron plants. The detached corms are taken away as a food material, stored in nearby fields for their use during, summer months when saffron attains dormancy. Rodent damage is visible from patches which have withered dry foliage resembling corm rot symptoms Effective rodent pest management can be achieved through an integrated approach as given under:

Management of Blyth's Vole, *Pitymys leucurus*

i. Due to traditional longer planting cycle, corm cultivation from raised beds, mixed cropping of saffron with almond and menace of weeds, rodents have found saffron fields as breeding ground due to availability of food material during fall months (October to March) when all other agricultural fields are fallow and thus devoid of any grain to be day as there is no check through management practices being followed by farmers. Management of rodent pests is very intricate as well as a ticklish problem. Effective rodent pest management can be achieved through an integrated approach as given under:

ii. **Field sanitation:** Removal of dropped debris and grasses from field to discourage rodents from availability of food and shelter.

iii. **Reduction in bund size:** Reduce the size of bunds or boundaries around the fields up to 30 cm to force the rodents to leave the burrows which will discourage the rodents to burrows and inhibit in the bunds (Nov.-April).

iv. **Mechanical control:**

Burrow Fumigator: A prototype of burrow fumigator was design and tested against rodent in crops viz., saffron and it was found very effective against rodents in field. In this method the killing of rodent is due to suffocation and lack of oxygen in burrow for 10-15 minutes.

Mode of the Application:

The recharge fuel (Cow dung +Maize straw +Local herbs) or (Cow dung +Maize pith +Local herbs) put into the top of the tank and then fire is ignited .When fire increase at the same time do rotate the handle of the blower, which is attached at the upper part of the tank. The dark yellowish green fume exit by outlet all rodent will kill those present in side of the treated burrows. In general in this operation two person is needed one who for rotate the handle of the fumigator to blow the fume inside the burrow and another one who will close the mouth of the burrow and kill the ruining out the rodent from the burrow.

v. Chemical control (Rodent bait schedule):

- **Day 1:** Plugging of rodent burrows
- **Day 2:** Identification of live burrows for pre-baiting (100gm) prior to poison baiting; For pre baiting with plain bait (crushed

rice (48 gm) + broken wheat grain/ wheat flour (48 gm)+ jaggery or sugar (2.0 gm and 2.0 ml. mustard oil) and place 10-15gm/ live burrow

- **Day 3:** 2.0% Zinc phosphide baiting(100 gm) during late evening with (crushed rice (48 gm) + broken wheat grain/ wheat flour (48 gm) + Zinc phosphide 2.0 gm and 2.0 ml. mustard oil, all mixed together) be placed inside the live burrow @ 6-10 g bait/ live burrow) .
- **Day 4:** Collection and burying of dead rodents. Close all burrows at evening hours
- **Day 5:** Identification of live burrows.
- **Day 6:** Fumigate live reopened burrows with Aluminum phosphide pellets @ 2 pellets/burrow or 5-10 g pouch/burrow and cover with wet mud.

Precautions:

- ✓ Since residual rodent population develops bait shyness after one baiting with Zinc phosphide, a minimum of 50-60 days gap should be given before it is used again.
- ✓ During snowfall/rainy season the pre-baiting /baiting should be applied on bait station, in the field.

vi. Trapping:

- ❖ May be effective tool for field rodent management thought Sherman trap in grid/line in saffron field placed @ 15-20 traps/ha.

It is extremely useful if integrated with chemical control as a follow measures for management of residual pest population surviving after poison baiting.

II. Indian crested porcupine, *Hystrix indica* , Family : Hystricidae

Indian crested porcupine, *Hystrix indica* is the largest rodent found in India. It is characterized by the presence of very long, stiff,

field bristle-like hairs (15-30 cm long) along the neck and upper back, which are erected in the form of a prominent crest when the animal is excited from the mid-dorsal region and down the lower flanks. The body is covered with quills, banded alternately with dark brown and white. Tail is clothed with short and broad quills, attached to the body by needle-like points. Ventral surface is scarcely covered with short, coarse, black hairs.


Porcupine and its attack in saffron

Management of porcupine:

i. Placement of light lamps in and around the field.

ii. Fencing is a preventive measure with 45-60cm metallic sheet can place around the field.

iii. To protect mature trees, place a 30 inch wide band of aluminium sheet around the tree trunk.

iv. LEGAL ISSUE: Jammu and Kashmir Wildlife (Protection) Act, 1978 (amended up to 2002) in its current form does not support any population management options.

Rodents (Indian crested porcupine, *Hystrix indica* and Blyth's Vole, *Pitymys leucurus*) are a serious constraint in saffron growing belts of temperate condition of Kashmir valley to effective control of rodent is only possible, if farmers worked together as a **'Community Mobilization and Campaign Mode'** approach.

Harvesting

Harvesting the flowers and separation of stigmas from the flower is a most difficult operation. It is time consuming, laborious and makes saffron the expensive spice of the world. To realize 1 kg yield of dried

saffron, it requires 4 kg of fresh saffron from 1.40 – 1.45 lakh flowers requiring services of 40 labour days. The flowers are picked exactly when they are ready to bloom and the saffron strand or stigma appear bright red in colour. The harvesting must begin shortly after dawn and completed quickly. If left exposed to the sun, saffron quickly loses its colour and flavour and withers under the sun light. High density plantation ensures more flowers per unit area. Existing good practice of flower picking suggests picking of flowers in early morning hours but growers pick opened flowers after sun rise as presence of dew on the flowers hinders picking process. Sun rays in presence of dew deteriorates saffron colour. Secondly opened flowers have low shelf life and for high stigma recovery. Separation has to be done within 10-12 hours which is a troublesome process when flower yields are high. Therefore, picking of unopened flowers under high density plantation

system is advised as it would not only give best quality product but will also give ample time for separation of stigmas due to more shelf life.

Stigma separation

In Kashmir opened saffron flowers are processed by family labour therefore process gets delayed particularly when flower yields are high. If stigma is not separated within 10-12 hours after flower picking, respiration of opened flowers turns stigma in to chaff like substance thus reducing recovery of pistil from 37.33 g/kg of fresh saffron flowers

to 22 g/kg of fresh saffron flowers. However, unopened flowers have better shelf life as respiration process is arrested till the flower opens and it take 24 hours. Therefore, separation of stigma from unopened flowers should be completed within 24 hours.

Saffron drying

Post harvesting handling of saffron, particularly the drying process is critical for the quality of saffron as indicated by the levels of secondary metabolites crocin (colour), picrocrocin (taste) and safranal (aroma). A quick dehydration post harvesting treatment is necessary to

convert *Crocus sativus* L. pistil into saffron spice as it prevents bio-degradation of crocin into crocitin which is a main issue with Kashmir saffron as farmers dry saffron in shade on a cloth in a thin layer or dries saffron flowers in sun which takes longer time (53 hours) leading to quality degradation gradually with time of sunlight exposure.

During the dehydration process, the stigmas loses 80% of their weight. Drying brings about the physical and biochemical changes necessary to achieve the desired attributes of Saffron. This process also play an important role in preserving this spice for longer period including transit and marketting. A lower moisture content, at least 10-12% value established by International ISO 3632 (*1*), maintains the quality of products for a longer time, however this safe moisture level is not achieved under traditional drying methods leading to post harvest quality deterioration.

Hot air or vacuum drying

Drying of unopened flowers of saffron at temperature of 60°C in hot air, solar, electrical or vacuum dryers is recommended. Drying temperature varies because stigmas from unopened flowers have more moisture compared to stigmas from opened flowers.

Packaging and storage

Saffron in filaments, cut filaments, and powder forms shall be packed in rigid, sealed, clean, and sound containers made of material which cannot affect the product quality and which protects it from environmental effects. Packing material shall be waterproof and consumer friendly. The packaging shall comply with any food grades materials and environmental protection.

Corm harvesting and storage

After 4 years of planting cycle lift the corms of Shalimar Saffron-1, store them appropriate conditions is quite important to avoid sprouting. Corms lifted in June can be stored in boxes covered with soil at 19–23°C and 65–75% relative humidity for 40-45 days. Shalimar saffron-1 has potential to yield 250-275 quintals of corms after 4th year of planting cycle under high density plantation and recommended irrigation schedule. The average stigma yield of SD-1-13 over 4 years was 8-10 kg/ha which is significantly higher over farmers managed natural population (5-6 kg/ha).

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