Good Practices for Saffron Production in Kashmir

PRACTICAL MANUAL

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Preface

Saffron is a legendry crop of Jammu and Kashmir. Over the past several years, the industry is running in loss on account of low saffron productivity and unorganised market. Though technologies ensuring high saffron quality with a productivity of around 5 kg/ha are available but implementation of technologies by the farmers is a big question due to high input cost.

Efforts by the policy makers at the State and Central Level has precipitated a mega project "Economic Revival of J&K Saffron Sector" under RKVY Schemes for Integrated Development of Saffron. The project aims at rejuvenation of entire saffron area of 3715 ha, providing irrigation facilities through creation of bore wells and sprinkler distribution system, providing dryers for quality saffron, construction of vermicompost units, improvement of soil health , capacity building and enhancing research and extension capabilities.

Spice Park that has emerged under the Project will serve as a centre for brand promotion and e-trading making saffron trade a success. Under the project, efforts will also be made to develop technologies for producing saffron in the non-traditional areas for improving the overall production.

Under National Agricultural Innovation Project, funded by ICAR, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir has developed Production and Post Harvest technologies that not only ensure yield gains but lead to quality improvement and reduction of post harvest losses. Technologies have been developed through farmers participatory research approach.

Practical Manual will reflect the Good Practices to be followed in Saffron production in Kashmir that will ensure an average productivity of 5 kg over a period of 4-5 years with the reduction in input cost. Technologies reflected in the manual will serve as a guide for rejuvenation of the traditional saffron area.

Authors acknowledge the financial support rendered by Project Implementation Unit, NAIP and Ministry of Agriculture, Govt of India for publication of this practical manual. I hope this manual will serve a stepping stone for future success of saffron.

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Why Good Agricultural Practices

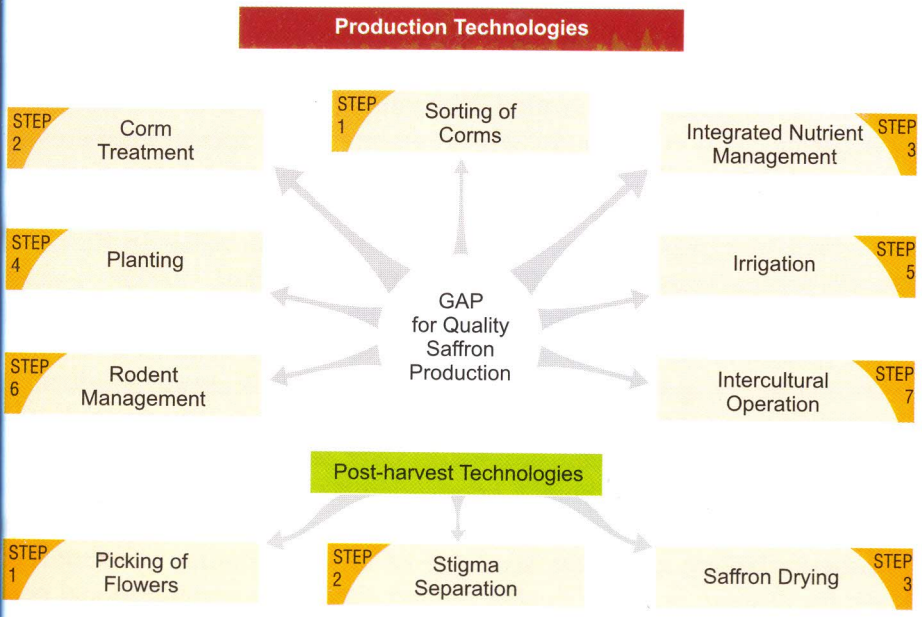
Good Agricultural Practice refers to any collection of specific methods, which when applied to agriculture produce results that are in harmony with the values of the proponents of those practices. Therefore, whether a practice can be considered "Good"or not will depend on the, standard applied. In this context, good practices in saffron production mean all those agronomic and post harvest practices that are not only suitable for yield enhancement, but are also environmentally benign based on low external inputs and ensuring sustainable saffron production.

Saffron by nature is a low input demanding crop in terms of energy, water and nutrients and its cultivation in Kashmir was introduced by the Central Asian Immigrants around 1st century B.C. Rajtarangini authored by Kalhana includes Kashmiri saffron among those special attributes of Kashmir that "could not be available even in the paradise." The Kashmiri Vaids namely Veghbhata and Sushtra used saffron as an important ingredient in Auyervedic medicines. It also finds its name in Kashmiri records which dates back to 5th century (Nauriyal *et al.*, 1977).

Saffron is a cultural asset associated with a considerable amount of indigenous knowledge.It is a niche crop of Tehsil Pampore in District Pulwama area expanding to new areas of District Budgam. Production technologies in saffron have not changed much, though new technologies and implements have been developed over time. Most of the farming practices are based on farmer's knowledge. Good Agricultural Practices (GAP) in saffron production have emerged to overcome the drawbacks of longer planting cycle, low seed rate of unsorted corms, infestation of corm rot disease, poor soil health, rainfed cultivation and traditional post harvest practices through a pragmatic research programme pursued at Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir.GAP in saffron not only improves saffron production but also the saffron quality and adoption of these practices should enhance economic benefits to saffron growers and ensure their livelihood security on long term basis.

In Jammu and Kashmir, Saffron is a source of livelihood for more than 16000 farm families and at present this industry is incurring a loss of

more than 50 per cent. The state at present produces 9.5 M.T as against a potential of 18.57 M.T that can further be increased to 28.50 M.T after regaining the glory of actual traditional saffron area of 5,700 ha with an average productivity of 5 kg/ha. The income from this industry can improve from ₹ 237 crores to ₹ 463 crores with an estimated price of ₹ 2.5 lacs/kg of laccha saffron. Therefore, the major strength to achieve this goal rests mainly on the adoption of available technologies ensuring high quality saffron production. Appreciating these facts, Ministry of Agriculture, Govt of India sanctioned a mega project to J&K State for "Economic Revival of J&K Saffron Sector" under National Mission on Saffron with a total financial allocation of ₹ 373 crores. In order to achieve higher productivity, using available technological opportunities, adoption of GAP would make a significant contribution. GAP for quality saffron production is schematically shown below:



Production Technology

Temperate climate with sunny days during the flowering period is favorable for good yield. Rains during September are favorable to initiate timely growth of roots and floral/aerial vegetative shoots.Localities covered with snow during winter at an altitude ranging from 1,500 to 2,400 m amsl provide necessary chilling for commercial cultivation of saffron. Saffron requires medium textured soil with good drainage capacity. Soil

with neutral reaction is best suited for saffron cultivation. Integrated Nutrient Management (INM) together with adequate plant population with suitable planting geometry, irrigation schedule, mechanized intercultural operations and rodent management are the technological approaches for improving production and productivity of quality saffron in J&K State.

Production technology in saffron involves seven steps. The existing practice and the good practice for these steps is given below:

Step-1: Sorting of Corms

Corm size in saffron varies from 1 to 20 g. Corms weighing upto 2 g have no flowering potential and upto 8g their potential is limited. However, corms weighing more than 8 g are productive and maximum flowering ability is shown by corms weighing more than 14 g. On the basis of corm weight, the corms are classified into 4 groups, viz., < 4 g (small), 4–6 g (medium), > 6–8 g (large), > 8 g [very large (Corms with 2.5–3 cm diameter have 8 g weight)]. Corms weighing more than 8 g, free from injuries and disease lesions are sorted out and the outer loose scales are removed before planting.

Different Grades of Saffron Corms—(a) > 15g, (b) >8 g, (c) 5-8 g, (d) <5 g

Existing Practice

Under traditional practice no sorting of corms is practised.

Good Practice

Since there is a direct relationship between corm size and flower production, large corms (> 8 g) are ideal for higher saffron production and productivity.

Step-2: Corm Treatment

Since last several years, a major biotic stress faced by the saffron crop is the corm rot fungal infection, a soil borne disease caused by *Fusarium monliforme* var intermedium an unidentified mycelium of *Basidiomycetous* fungus. About 46 per cent of the soil in the traditional saffron fields is infected with the fungus and the infection is spreading steadily. Saffron fields are also highly infected with plant parasitic nematodes that cause chlorosis of radical leaves and they turn yellow leading to complete corm rot.

The diseased corms show dark brown sunken and irregular patches below the corm scales. The rot lesions are usually 1 mm deep having raised margins and are usually located in root and bud regions. In severe cases, the entire corm turns into black powdery mass with outer fibrous scales in position. In some corms, white or yellowish white fungal mass is observed. Diseased corms produce foliage giving "Die Back" like symptoms. No spots are observed on leaves. Yellowish foliage can be easily pulled out from the diseased corms.

Healthy Saffron Corms

Infected Saffron Corms

Existing Practice

Management practice is not being followed by the farmers for the control of saffron corm rot in the existing crop or for the fresh plantation

Good Practice

Cultural Management

- Cultivation of Saffron under shorter planting cycle of 4–5 years
- Plantation of healthy corms free from rot, lesions/injuries

Chemical Control

Fungicidal suspension is prepared by dissolving 50 g (0.1%) of carbendizime 50 WP and 150 g of Mancozeb 75 WP (0.3%) in 50 litres of water. Graded saffron corms free from lesions and loose scales are dipped in the fungicidal suspension (maximum 1.5 q) for a period of 5–10 minutes. Saffron corms are taken out from the suspension using a willow basket and allowed to dry in shade for a period of 15–20 minutes to drain off excess moisture. Same suspension can be used 2–3 times.

Step-3: Integrated Nutrient Management

Existing Practice

The practice of growing saffron year after year without supplementation of nutrients has drastically reduced the fertility of the soils in the saffron fields. Except potassium, the organic carbon, nitrogen and phosphorous of these soils has declined. Consequently, the size and vigour of the corms produced every season is reduced, directly affecting the crop stand and flowering potential of the plant.

Good Practice

In order to address the decreasing productivity of saffron due to decline in fertility status of soils, Integrated Nutrient Management is considered a better option for sustainable development of crop for livelihood security. The concept of INM implies, evolving strategies which utilize major nutrients through commercial fertilizers in a balanced proportion on one hand and use of organic manures on the other along with adequate biofertilizers depending on their availability/feasibility for a given location.

INM For Good Saffron Crop

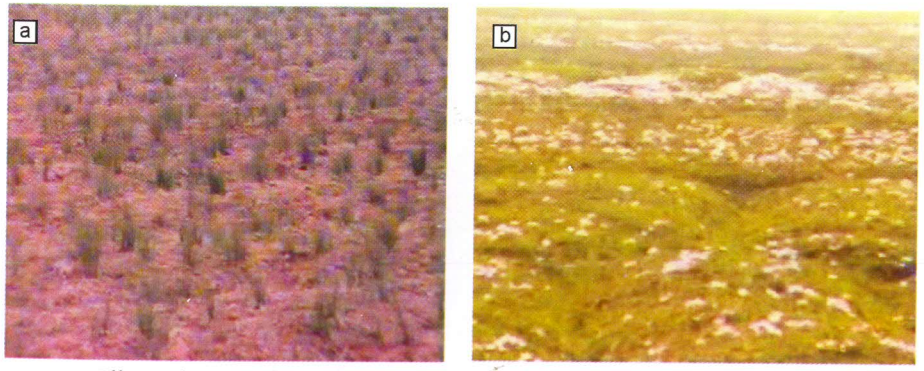
One kg of total dry matter of saffron has been reported to remove 12 g N, 3 g P and 22 g K from the soil. Recommended INM module used in the farmer's field through participatory approach, conducted over 4.2 ha of saffron area of Kashmir, has shown improved soil health in terms of physical, chemical and biological properties and improvement in overall factor productivity/unit area together with improvement in water holding capacity and bulk density.

INM Schedule

1. Inorganic fertilizers=N : P_2O_5 : K_2O :: 90 : 60 :50 kg/ha
   (i) Nitrogen in the form of urea @145.728 kg/ha (7.286 kg/ kanal)
   (ii) Phosphorous in the form of DAP @ 132 kg/ha (6.600 kg/ kanal)
   (iii) Potassium in the form of MoP @ 83 kg/ha (4.150 kg/kanal)
2. Well decomposed farmyard manure @ 10 tons/hectare (5 quintal/ Kanal)
3. Vermicompost @ 5 quintals/ha (25 kg/ha)

Method of Application

- Band placement of fertilizers
- Half dose of nitrogen (urea) and full dose of well rotten manure (FYM), phosphorous (DAP), potassium (MoP) and Vermicompost to be applied as basal dose during 2nd hoeing (August/September) in existing crop and at the time of planting in fresh crop
- Another half dose of nitrogen to be applied immediately after flowering with the onset of vegetative phase in the last week of November, ensuring availability of moisture.



Effects of Poor Soil Health—(a) Poor Vegetative Growth (b) Sparse Flowering

Profuse Foliage Growth

Flowers In Clumps

Step-4: Planting

Existing Practice

Planting cycle, planting time, planting method and seed rate are the critical factors for saffron productivity. Mother corms once planted are retained in the field for many years, allowing these to produce daughter corms which continue the production cycle without interruption, though at the cost of declining productivity. The planting cycles are generally of 10–12 years duration.

Prior to the plantation of saffron corms deep ploughing is done using bullock drawn plough. Every month from January-September ploughing is carried out to keep the field clean. After the field is ready, corms of different grades are planted in September by hand dropping of saffron corms behind bullock drawn plough. The field is laid out into 2 m × 2 m beds with deep drainage channels on both the sides.

Good Practice

Shorter planting cycle of 4–5 years is recommended. Deep ploughing is recommended involving tilling the soil to a depth of approximately 30 cm using bullock drawn plough and planking is recommended. This operation can be mechanized using tractors and matching ploughs and harrows. Ploughing is done in the same furrow to achieve required depth as well as to keep the field clean. Operation can be carried out in August instead of long operational calendar being completed over a period of 4 months under traditional practices. Saffron corms are planted in rows at a spacing of 20 × 10 cm and at a depth of 15 cm with 1corm/hill or with a planting geometry of 25 × 15 cm with 2 corms/hill maintaining a planting density of 5 lakh corms/ha with a seed rate of 50 quintals/ha. Alternate furrows can also be operated by which the soil from each new