REPORT ON

INTERNATIONAL TRAINING PROGRAME ON CULTIVATION, PROCESSING AND VALUE ADDITION OF SAFFRON:





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Report Prepared

By

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Afghanistan Rural Enterprise Development Program (AREDP),
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Hosted by:

CSK Himachal Pradesh Krishi Vishva Vidyalaya (CSK HPKVV), Palampur, CSIR-HIBT, Palampur and Sher-e-Kashmir University of Agricultural Sciences and techonology (SKOAST) Kashmir

Organized By:

Center for Environment and Environment Development, New Delhi, India.

INTRODUCTION

The international training program in cultivation, Processing and Value addition of Saffron is for trainees from Afghanistan in association with the Ministry of Rural and Development (MRRD) Afghanistan. The event is scheduled to be held from 7th to 17th November 2012, in CSK Himachal Pradesh Krishi Vishva Vidyalaya (CSK HPKVV), Palampur, CSIR-HIBT, Palampur and Sher-e-Kashmir University of Agricultural Sciences and technology (SKOAST) Kashmir organized by Center for Environment and Environment Development (CEED), New Delhi, India.

Saffron is the world's one of the most expensive spices cultivated in not many areas of the world. The use of the spices dates back to 1500 B.C. in some parts of the world like Spain, Europe and in Greece but in Asia Minor it was cultivated from the last 100 years used in Perfumes, dyes, food and beverage flavoring. Today Spain has emerged to be world's largest producer of the valuable Spice. Other places like Iran, France, Italy, Afghanistan and some pockets of India like in the Kinor valley of Himachal Pradesh and Kashmir valleys in Jammu and Kashmir.

The crop holds is significance as the most expensive crop grown in the mountain areas which has a huge demand in the market and the supply being significantly low. The crop can help combat the mountain poverty and provide gainful employment. The Saffron production today is going down due to the fungal diseases that mainly infect the corm (corm rot) of the Saffron plant. Thus it becomes important to study how to free the plant from diseases and it becomes important to learn and exchange ideas of different mountain communities who cultivate Saffron about the methods of cropping for a maximum yield. Thus with this intention this program is scheduled for the trainees of Afghanistan. It intends to make them understand and analyze the method of cultivation of the spice in India and share their knowledge about the cultivation in Afghanistan started at 10 am in the 7th of November in CSK Himachal Pradesh Krishi Vishva Vidyalaya (CSK HPKVV), Palampur.

LIMITATION

The language became a great difficulty for communication owing to the less understanding of the Afghan trainees of English or Hindi and the Indians not comprehending Afghan language. Difficulties were also faced in not being able to identify the location of the places and thus ending up in long distance travelling.

DAY 1- 7th November

The training started at 10.30 am in the conference hall of the CSK Himachal Pradesh Krishi Vishva Vidyalaya (CSK HPKVV), Palampur. The organizing committee consisted of Dr Sangita, Dr.Ashutosh Mohanty and Dr. Ashok Panda. The training was chaired by the Director of Extention Education Dr. Desh Raj with the welcome note by the Vice chancellor of the hosting university, Dr. S.K.Sharma. The program was attended by five trainees from Afghanistan and various scientists working in the field of Saffron and department heads of the university and the media.

In his welcome note the Vice Chancellor highlighted the importance of the Saffron cultivation in the mountain areas. He said that Saffron is the costliest spice and it is in great demand where you can get more income per unit area. He told the floor history of Saffron cultivation which he said started as far as 300 years back and known to be originated in Spain and spread along Europe, Greece, Iran and to India eventually in some parts like Srinagar in Jamu Kashmir and Kinor in Himachal Pradesh. The Himachal area needs to enhance the Saffron cultivation. As it has been seen that mostly the northern part of the countries Saffron is cultivated and there is a need to grow Saffron in large scale to see the feasibility also including Afghanistan.

He said there are the four important facts to be kept in mind when it comes to Saffron Production:

1. Quality Planting material

2. Agro Techniques

3. Processing

4. Marketing.

He expressed that this being the first collaboration of the university with Afghanistan. He hopes for more collaboration and welcomes them to share their experience and expertise in this field. He suggests the training will be important and diverts the attention of the Afghans to get involved in agriculture.

With the thanking note from Kaihan Barak-Zai and the coordinator Dr. Sangeeta the first session came to an end.

At 11.30 The training program started with the presentation of Dr. Madhu Sharma a senior Scientist in CSIR- Insstitute of Himalayan Bioresources Techonology, Palampur, Himachal Pradesh India, on the Micro propagation of Saffron for Production of disease free corm let. She presented mainly about the propagation / tissue culture (growing your plant in the Jar / flask and later taking to the field) of the Saffron plant. As saffron is being increasingly infested with fungal diseases and destroys the Saffron corm and as Saffron yield depends upon the corm size and the

flowering on the corm tissue culture method can be employed for the production of disease free planting material.

In tissue culture / invitro cultivation the selection of the mother plant is very important. A healthy disease free plant should be selected and then there is the establishment of Aseptic cultures followed by multiplication, rooting of seeds and finally it is been taken to the field. The tissue culture has many advantages like:

1. Rapid multiplication
2. Early introduction of elites
3. Economy of space
4. Conservation

Including some disadvantages like:

1. Well developed infrastructure and skill requirement
2. Labour intensive and expensive

The invitro saffron plant, the corm swells and you get 100 of shoots which develop into corm. The time for tissue culture is very important and the temperature of 23 degree to 27 degree. The installation charge in the tissue culture is 3.107 per comb and from laboratory when taken to the field in the second year there was seen a double production. Due to the problem of climate unsuitability in Himachal the cropping center is shifted to Srinagar in Kashmir the natural habitat of Saffron in India.

The second presentation was given by Dr. Markendey Shing a principal scientist of CSIR-Institute of Himalayan Bio research technology, Palampur (H.P) India on **"Cultivation technology of saffron"**. Where he talked about the saffron plant being tripod and sterile plant and fails to produce seeds. Thus we need to standardize the agro technology because what is the need in one place may not be in the other depending on the climatic condition. Proper forcing which means after harvesting keeping saffron in a required temperature 23 degree to 27 degree to develop gymnasium and kept in 17 degree to produce shouts and flowering and low humid area with clean sunshine..

CLIMATE: In temperate climate at an altitude range of 1300-2800mts where seeds are covered under snow during winter is important because the plants in highly humid areas saffron corms are infected by fungal disease. Depending on the size of the corm forcing is done and corm is stored in conditions in 130days and another in 70 days in room temperature at 17 degree flowering starts in just 45-55 days but the ones just stored in the room temperature showed no flowering. Bigger the size of corm gives more flowers, and it has been found out that if saffron is used as an annual crop it gives better yield instead of using it as a perennial crop which will also help regain the soil fertility.

SOIL: In sandy loam PH value should be 6.8 to 7.8, in clay soil mix soil with sand and apply farmyard manure to make it porous if the temperature is favorable. Corm rots if the soil is water logged.

BED PREPARATION

Field has to be ploughed three to four times with depth of 25 to 30 cm to bring soil into fine and porous. In sandy soil, addition of 20 tons of organic matter is important and bed should be raised to 12 to 15 cm.

QUALITY

The color of the saffron determines the quality of the saffron. Dull or dark color is not good but if the color is bright the quality of corm is of superior quality. If there bottom of the corm is turned black it is infected with fungus and it cannot be planted. Size and weight of the crop and spacing is also important. The bigger corms yield better produce like in Italy they generate 130 to 150q from 6 to 7 lakhs corms from one hector.

METHOD OF PLANTING

Time spacing line to line and corm to corm is important. Generally it is 8 to 10 cm from corm to corm and depending upon the size of the corm the spacing depends like corm size above 2.5g there should be 10 to 12 cm row to row and corm to corm, it is a square system plantation. And the depth should be at least as deep as 15 cm.

15 to 20 days of irrigation is needed. Invitro cultivation of the corm requires lesser number of flowering days which is lowered and the length of the stigma is also longer.

NUTRIENT MANAGEMENT

When 1 tons of saffron leaves are grown 10.2 kg. Nitrogen, 3.2 kg. Phosphorous 22.83 kg. Potassium is removed from the soil. Farm yard manure as a basal dressing is recommended.

In sandy soil addition of 20 tons organic manure with 100kgs NPK has resulted in highest Saffron yield. Irrigation in an interval of 15 days during August to September will help early blooming.

WEED MANAGEMENT

Lots of weed problem can be mechanically controlled like the hoeing, weeding done in the month of July to August.

FLOWER HARVESTING

Flower harvesting and separation of stigma is very different and time consuming, laborious and makes saffron as the most expensive species of the world when fully bloomed. Picking of 1000 flowers need at least 45 to 55minutes and 100 to 130 minutes to remove the stigma for drying. After dehydration is a post harvest treatment of drying the stigma like solar drying done in India or artificial drying techniques are adopted.

DAY 2 – 8th November

At 10.30am **"Scientific plantation and breeding of saffron crop"** by Dr. V. K Shoodh Department of crop improvement, CSK, HPKV, Palampur. The presentation was mainly about breeding of the saffron and about the study of germplasm; the genus crocus flower includes about 80 species distributed from South Western Europe, through central Europe to Turkey and South western part of Asia.

Saffron improvements must involve two principal strategies:

1. Searching identification and separation of superior clones in existing germplasm collection.
2. Creating new valuable clones through experiments.

The Saffron crop are generally unbalanced garments which makes it sterile garments and thus no seed production is there thus new methods like mutation and polyploidy can be applied. Mutation is done when floral shoots has come out from corm because meristem differentiation and maximum mitotic. Physical mutation has been tried like Muzafrova and Akhund zade (1975) tried physical mutation using gamma race which increases the possibility of new types of corm production, flowering and stigma weight for 3 to 4 years. The practice of mutation has been applied but has not produced a good result.

Polyploidy which is the doubling of chromosomes number from 24 to 48, then there is a possibility to generate seeds but this experiment could be expensive and time taking.

Molecular and Biotechnological approach, where invitro technique and molecular genetics are applied like the DNA polymorphism based AFLP method. Genetic diversity within and between 39 Iranian saffron were studied using micro 10 micro satellite markers which showed a genetic diversity among the saffron ecotypes which gives a great possibility of development of new varieties of Saffron.

11.45 am –**"Presentation on Diseases and insect pests in Saffron"** by Gopal Katha, Department of Crop improvement CSK, HPRV, Palampur.

Stresses like biotic and a biotic lower corn yield in saffron. There is a need to adopt practices depending on the cost effective harnessing.

Biotic stress like diseases especially fungal diseases in Saffron like corm rot, dry rot, leaf rot. Pests like mites, thrives, white grubs and rodents like rat, moles, rabbits etc.

The control of saffron pest and diseases becomes very important like:

Host plant resistance, cultural practices, maintenance of natural enemies, Judicious use of chemicals and timing of plant protection operation plays an vital role which if not done can cause large scale destruction of the saffron plants.

Disease management can be done in a number of ways like

1. Cultural practices where healthy disease free corm selection becomes very important. Soil amendment with farm yard manure and soil solarization.
2. 2. Biological management where fertilizers like Trichoderma which is a kind of bacteria is being added to farm yard manure in the proportion of 1 kg to 20 kg respectively.
3. 3. Chemical management where corm is dipped for 30 minutes before planting in a solution of 1g chemical in 1 liter of water.

2.15- Interview with the media person.

2.30- pm-**Food safety issues and SPS-** Dr. Ashok Kumar panda.- Department of Vetenary Public Health and Epidemiology college of Vetenary and Animal Sciences CSK-Agricultural university, Palampur. H.P, India.

To highlight the importance of food security and the international laws set by ISO the lecture was a special delivery by the professor.

Food quality refers to the combination of characteristics that enhance the acceptability of a product. This includes

1. External Factor as appearance (size, shape, color, glow, texture and flavor.)
2. Internal factor like chemical physical or microbial.

When talking about food safety, quality control or quality assurance comes in to it ensures that all the desirable characteristics should be maintained. A scientific discipline describing handling, preparation and storage of food in ways that prevent food borne illness. Food can transmit disease from person to person as well as serve as a growth for bacteria like causing food poisoning.

When talking about physical quality orange, yellow colored stigmas. Chemical qualities include three carotendoids crocin- coloring agent, picrocine and safranal. The quality standard is measured by a grading system in a laboratory according to the conditions organization like color intensity grades: iv (poorest), iii, ii and i(finest quality) like I S O(International Standard Organization)Without understanding the international policies, people try to do adulteration and contamination where pesticide, chemical residues and bacterial.

The international protection laws set for international standards can be applied in terms of two countries if they have got into a bilateral understanding.

3.30 pm- Visit to the CSIR-HIBT, Palampur. Where the participants were shown the tissue culture of Saffron and other plants followed by a talk with the Director of CSIR and media persons and the day ended with the visit to the saffron field.

INSIGHT FROM THE TRAINING:

Training start with lot of interests from the University faculties and Administration to have long term cooperation and collaboration among the Afghanistan researcher and entrepreneurs. The training programme was covered and highlighted in local and national newspapers. Over all the first part of the training went well and the trainee gives lots of interest to know many scientific research and feedbacks on Saffron cultivation from the university faculties and scientists.

ACHIEVEMENTS: The participants learned about various agricultural techniques of Saffron culture and specifically tissue culture of Saffron in control environment in laboratory environment.

II PHASE

TRAINING PROGRAMME IN SHER-E-KASHMIR UNIVERSITY OF AGRICULTURAL SCIENCES AND TECHNOLOGY (SKAUST) KASHMIR:

INTRODUCTION

As per the schedule and successful training in CSK Palampur, Afghan team headed by Dr. Ashutosh Mohanty travel to Sher-e-Kashmir University of Agricultural Sciences and technology (SKAUST) Kashmir. The Afghan team reaches SKAUST, Kashmir via Jammu on 9th November 2012 at 2.30 pm. As per the revised schedule the team, visited Kanwal Saffron and Agro processing unit .They have discussed marketing strategy, international certification, quality control, centers of Saffron marketing units in India and popularity in the region. They have shown their Saffron pack and product quality as brand in Kashmir. The owner and director of the Kanwal saffron interested to have trading collaboration and cooperation with afghan entrepreneurs and provide the packaging support the afghan participants. The next day 11th November the University has organized a field trip to Gulmarg, the famous tourist destination of Kashmir to have seen the Kashmir valley closely. The enchanting beauty of Kashmir valley thrilled Afghan Participants.

INAUGURATION OF THE PROGRAMME:

DAY 1-12th November

The training inaugurated on 10.30 am by honorable Vice Chancellors Dr. Tej Pratap at Meeting Room of the Sher-e-Kashmir University of Agricultural Sciences and technology (SKOAST) Kashmir. The welcome address given by the Dr. Ashutosh Mohanty, Director CEED, India as coordinator of the programme and briefed about the aim and objective of this training programme .Then Remarked by Afghan Participants headed by Kaihan, MRRD Representative, addressed by Dr. Shafiq A.Wani, Director of Research, inaugural Address by Honorable Vice-Chancellor Dr. Tej Pratap and finally vote of thanks by Prof F.A Nehvi. The inauguration session also attended by various Researcher , academician and scientists working in the field of Saffron from the university .

The first Resource person of the training was Prof F.A Nehvi, who delivered the lecture on Package and practices of Saffron Cultivation (climatic requirements, methodologies, improvement of saffron cultivation, parameters of cultivation, Packaging technology etc). He also elaborates discussion on various mechanisms of saffron in Afghanistan and India. Land Preparation, irrigation and rain fed system. He described the various packaging technology and standardization, quality control of saffron for international exports.

The Second Speaker of the session was Prof.Gul Zaffer, Prof of Plant Breeding Technology. He describe about the Historical concept of Saffron, saffron cultivation in global scenario and how saffron cultivation shifting from Europe to central Asia and part of India, Pakistan, Afghanistan and Iran. Importance of Climatic conditions, cultivation practices, temperature, precipitation, weather patterns. He describes the Drying technology for saffron to maintain its quality. He also describes the Cultivation patterns of saffron in Kashmir with other countries. He mentioned the Saffron harvesting with approved quality, color, temperature, fragrance management.

DAY 2 – 13th November

10.30 am. Prof. Dr. M.D Shah division of Plant breeding delivers the lecture on Corm Rots of the Saffron. . The presentation was mainly about Various Symptoms, Color Change, Pathogens, host Predisposing factors, temperature impact on spreading of diseases in Saffron. He also describes various corm rot in the field and how it infected yield of the production.

Dr. Shah also describe elaborately on Disease Management in Saffron Cultivation.

1. Biological Management
2. Chemical MANAGEMENT
3. Use of Chemical Fertilizer

He also elaborated about use of FYM, Solarization for disease management. He discussed about the Organic Saffron and its demand in western and international market.

12.30 P.M: the next speaker was Prof. Abu Manzar, Dry land (Karewa), Agriculture Research Center and he elaborated about the Rodent in Saffron and their Management . He described the amount of loss of production of Saffron in internationally and Kashmir, India and Variety of Rodent species, Rodent problem in Kashmir and south Asian region.

He has given the figure of Rodent loss in Food production and compare with Saffron cultivation. Finally, He described about the Rodent Management. He mentioned about the workers committee, Cultural practice, Reduction of Bond size Mechanical Control Trapping system, and Chemical control.

Finally, he described about the Indian wild life protection Act 1978 (modified in 2002) hindrance in the way of control rodent like Porcupine. He mentioned about the integrated approach for rodent management and effective control of rodent in a particular area.

2.30 Dr. Gowhar Ali did a lecturer on Saffron Cultivation Practices. He starts his lecture on major saffron producing countries in the world and scope of and factors suits the saffron cultivation. He also revealed the uniqueness of Saffron cultivation in Rain fed and irrigated saffron, features of important saffron growth in major saffron producing countries globally. Major factors in saffron cultivation; climate, weather, humidity, water availability, temperature etc. Problems of Saffron cultivation in Kashmir and globally. Good Practices of saffron

cultivations, cycle of saffron cultivation. He discussed Integrated Nutrient Management, irrigation, drying, packaging and storage. He also reveals conventional breeding methodology and methods of clone collection.

DAY 3 – 14th November

10.30 Trainees visited Saffron Research Center SKUAST-K at Pampur and it is leading by Dr.Sabina Nager. She had shown various saffron research applications in the field by university scientists. She also demonstrate different saffron breeds, cultivation techniques ,field preparation, selection of corms and collection of saffron, dryer, rodent management, training initiatives with local farmers. Dr. Shaheena Nagoo had shown the Chinese technology in the research center and how it is effective in coming days. She had shown the research on Indore saffron cultivation and results in India. As it is experiment basis, the final output could be known after completion of the research. However, so far it is successful in Indore cultivation with controlled room environment.

12.30 PM meeting with number of Saffron trader to know marketing strategy, international demand, possible trade link and import saffron product from each other countries. Afghan entrepreneurs meet the delegation headed by president of All Jammu and Kashmir Saffron Growers Development and Marketing cooperative Association Ltd. Mr. Abdul Majeed Wani. The Afghan entrepreneur discussed with major saffron traders and cooperative societies, branded entrepreneur from each countries. During the discussion, both of the traders agreed to exchange their products. The trainees also visited the Unique Saffron growers' welfare and Development Co-operative marketing ltd. Afghan entrepreneurs are also sale 1 KG saffron to the trader and exchange saffron products as a beginning of trade link between Kashmir and Afghanistan. Afghan entrepreneur also learn the various techniques of saffron processing, packaging and marketing. Afghan entrepreneur also discussed how the Afghan product could sale in Indian market and Kashmir saffron could marketed in Afghanistan. They have exchange of cards and contact detail, packaging machinery, international standard certification, quality control etc.

15/11/2011

10.30 the Afghan trainees visited to Tissue Culture Lab of SKUAST-Kashmir .Dr. Salwee Yasmin given a lecture on Application of Tissue Culture in Saffron cultivation . She presented basic tissue culture application in Saffron, Tissue culture plants, Cell differentiation, invitro fertilization followed by lab setup and preparation.

She elaborated about the media preparation Room;

a. Glassware
b. Equipments

c. Straial Environment

She elaborated about the Transfer Area, culture Room and Method of sterilization e. g.:

a. Stem
b. Dry
c. Filter
d. Flame

She explained about the explants (bringing from the field), growth of the plant in control room environment, Media prater (mineral for saffron growth), and Macronutrient and Micronutrient propagation. She explained necessity of soil testing for composition of soil as requirement of growth of Saffron in particular area even in arid environment. She also explained on use of hormone, sterilization, fungal contamination, corn rots could be reduced in tissue culture lab. She also explained how to build a tissue culture lab and machinery requirement for saffron cultivation in a lab. She explained after the fully-grown saffron from the lab could be planted in the field after 3 months.

12.30 The trainee traveled to meet the another Saffron processing unit in Kashmir called as Kasmir Kessar Mart and its owner Noor U Din Azad . The owner explained about the trade in Kashmir. The Kashmir Mart owner discussed about his saffron export business in countries like German, Italy, Sweden, France, USA etc. Afghan trainee exchanged their saffron product, discussed about trade link, processing and packaging machinery, availability of distributer, average price in Kashmir, sales duty in India. The owner showed his packaging and processing unit in his premises.

16/11/2012

10.30 Prof.M.A.Mir presented on topic on" Prospects of Package processing of saffron in Kashmir. He explained about the SWAT analysis of Saffron in the context of economic benefits.

Strength: He reveals that the main strength of the Kashmir is its climate, Technological support from University.

Weakness: Poor quality of cultivation procedure, land preparation, Corm selection, non-adaptation of scientific post harvest technology

Opportunity: More demand of quality corm production, Employment generation specially women,

Threat: Adulteration, Efficient Marketing System, Consumer Efficiency, processing of saffron and marketing of saffron in international Market.

He described about Consumer Right for the Saffron, different stages of Saffron Processing and Marketing aspect of saffron. He has shown the packhouse of saffron cultivation, processing, and

machinery for drying, solar drying in the SKUAST –K university campus. He described about the communication, location, market availability for the pack house of saffron. Finally He described about the various medicinal value of saffron and its application for healthy life as an antioxidant product.

2.30 P.M Afghan trainees are finally visited the vermin compost culture center at SKUAST-K campus headed by Dr. Sabina and Dr. Shaheena. They also had shown FYM in university campus. Finally, trainees are awarded the participation certificate and training hand book on cultivation, processing, and value addition of the Saffron.

17/11/2012

Vice chancellor meets all Afghan participants and discussed about the challenge during the training period, get their feedbacks, training benefits and specifically in the context of the Afghanistan. He also assures in future training he will give special attention towards communication and whole campus will be WIFY and provide telephone, internet and other communication means.

Achievements of the Training: Trainees learn about new technology of saffron cultivation, saffron disease management specially the corm rot management, organic cultivation, Tissue culture and techniques for control room environment.

Challenges; Major challenges of training in Kashmir is communication specially internet and telephone for afghan participants which has great burden to communicate with trader and home country. In addition, Afghan participant are quite poor in English and lack of scientific background, which was big challenges to delivering the training.

Conclusion: As per the training module, whole training was well designed; subject delivered on saffron was quite appreciated by afghan participants. Especially the technical parts were quite interesting and great learning for afghan participants.

Afghanistan Participants in this Program as Follows:

SL NO.	NAME OF PARTICIPANT	PASSPORT NO.
1.	Kaihan barakzai	MRRD OA 815337
2.	Javid	MRRD OA 104948
3.	Abdul Rahim	MRRD OR 952878
4.	Bashir Ahmad	Owner of Ariana Saffron OA 815215
5.	Omar farooq	Owner of Mahtab Saffron