GROWING SAFFRON ON HORTICULTURE

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INTRODUCTION

Saffron (*Crocus sativus*) is the most valuable agricultural and medicinal product in the world. It has a special place among Iran's industrial and export products. Saffron is used in food, cosmetics, health, pharmaceutical, dyeing and art industries. Saffron has a special place in the agricultural pattern of South Khorasan and Khorasan Razavi due to its characteristics such as little need for water, job creation, currency exchange, easy transportation, maintenance, the time distribution of work and also the use of all plant organs.

GENERAL BENEFITS OF GROWING SAFFRON

- No need of land preparation.
- The required light is adjustable.
- Water to be used in the form of humidifier, mist and water cooler
- Its consumption is completely controllable and economical.
- Humidity is adjustable.
- Saffron bulbs are safe from rodents, especially mice.
- Spraying operations are very convenient and controlled.
- Weeding and weed control operations are also very simple and insignificant.
- Harvesting operations are controlled and convenient.

PURPOSES

- Higher yield
- Higher number of flowers
- Improved chemical components of saffron such as Crocin, Picrocrocin and Safranal
- Lesser chances of diseases, disorders and rodents attack
- Higher quality of final product
- High density of saffron bulbs in shelving system on horticulture (4000 kg bulbs in 60 square meters covered environment)

	Yield (Per 1000 Kilogram of Bulbs)	Crocin	Picrocin	Saffranal	Density (6000 Kilogram of Bulbs)	Controlling Disease & Disorder & Rodents
Growing Saffron Outdoors	500 gram	270	70	20	1 Hectare	10 %
Growing Saffron Indoors	1500 gram	290	90	31	60 meters	90 %

HORTICULTURE SAFFRON GROWING

For producing 6 kg saffron bulbs in basic 100 square meters production unit, there are 42 scaffolds with the following dimensions: **120 cm x 50 cm x 200 cm (Length x Depth x Height)**. Each scaffold holds 5 racks (empty bottom, secured with wire mesh on top of the wooden boxes). Distance between each rack should be 35 cm. For extra space between the racks 220 cm tall scaffolds can be used and racks should be redistributed every 40 cm.

CROPPING SCHEDULE

Ideal bulb size should range between 30 and 40 grams each. Bigger the bulb the more flowers it will bring to maturity. Approximate harvest on 40 gram bulbs will be 3/4 flowers. If bulb size is under 30 grams, you have to keep only one flower in order to ensure full maturity without crop loss. Saffron bulbs don't like temperature fluctuations. This is important. Hence, during paramount phases, such as flower emergence and flower establishment, temperature must be strictly controlled to ensure the stability. Monitoring and equipment must be controlled to avoid disturbance and crop loss.

SUMMER:

During the hottest months of the year, saffron bulbs will be dormant. This is the right time to purchase them and set them up in the growing chambers. Bulbs should be distributed in the wooden boxes, they must be kept in dark at a temperature around 25°C. Neither humidity nor CO_2 enrichment is required at this stage. Just make sure the growing room is not damp or too dry.

BEGINNING OF AUTUMN:

During initial days of autumn, gradually decrease the temperature by 1°C per day until an optimum of 20°C is reached. Gradually allow the sunlight to enter in order to reach 800 Lux during the day. CO_2 levels must be increased gradually during the first week of adjustment until they reach 2000 ppm. Humidity must be increased upto 70%. These parameters must be maintained for the next three weeks

During the crucial first 3 weeks, bulbs will start sprouting. The flower stalks will emerge from the bulb using the nutrients accumulated after 3 weeks, stalks should reach an average height of 3/4 cm.

During the upcoming weeks, all levels must be changed to treat the bulbs with a cold shock. Temperature and other values must be gradually adjusted to mimic a natural process. Temperatures must be gradually brought from 20°C/during the day to 12°C/during the day, from 17°C/ during the night to 10°C/ during the night. CO_2 levels must drop from 2000ppm to 700ppm. Increases RH to 85%. Keep the bulbs at these levels for a week, after that increase temperatures a little bit, bringing them back to 17 °C (day), 14°C (night), CO_2 level 700 ppm and 1000 lux light.

Flowers should reach maturity in the upcoming 2 weeks and are ready for harvesting, snap the flower stalk, collect in an open basket lined with cloth. Process the flowers according to instructions. The bulbs, at this stage are ready for vegetating in open soil. Also, make sure to give plenty of nutrients (mature cow dong and Humic Acid) in order to ensure propagation and growing of the bulbs for the next crop in the next year.

REQUIREMENTS

- Wooden boxes
- Shelves
- Air Conditioning System
- CO_2 meters
- Lux meter
- Drying System

GROWTH PERIOD

June is the peak of bulbs dormancy and the best time to harvest and transfer the bulbs to the greenhouse. After the yellowing of the grass, the bulb is separated from the soil (bulbs are removed with a shovel to avoid the damage to the bulbs), after that store the bulbs in proper and cool air conditioning environment.

Bulb straws must be removed before taking them into the greenhouse. While separating the bulbs from the ground in June and taking them to the greenhouse, the light levels must be kept low. At this stage, bulbs are sensitive to heat. When the sprouts grow up to 2 cm, increase the amount of available light.

If the temperature rises above the optimum range, leaves will appear. If the temperature falls below the optimum range, the bulbs will start rooting. If roots or leaves become visible, levels must be kept in range to avoid loss of the crops. Gibberellin is used to wake the bulbs.

During the first week of September, put the bulbs of the desired weight in wooden trays and transfer them to the greenhouse. The temperature in the greenhouse should be 25 °C and the humidity should be 80%.

PROBLEMS OF SAFFRON ROOT GROWTH ON HORTICULTURE SYSTEM

- The risk of bulb rot increases.
- Causes disease transmission.

CONCLUSION

- With the horticulture system, every 1500 flowers give us 2 kg dried flowers.
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- Picrocrocin on horticulture system reached 90
- Crocin on horticulture system reached 290
- Safranal on horticulture system reached 31
- On horticulture system, the disease and disorders of saffron decreased over 80%
- Water consumption efficiency increased over 80%
- On horticulture system, we could increase the density of the bulbs of saffron 20 times compared to traditional cultivation
- Labour cost got decreased upto 100%
- Eliminating the limitation of the time of harvesting flower