Ministry of Science, Researches and Technology

Khorasan Science and Technology Park

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Title:

Production technology and processing of Saffron (Crocus sativus L.) in Iran

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Introduction:

- Iran is the largest producer of saffron in the world (65% of world production)
- Provinces of khorasan with 98% production are the most important points of Iran for saffron production.
- Cultivation area in khorasan in 2004 is 54850 ha
- Production 213.62 tonne
- Export 172 t
- Value of export 95 million dollars
- No. of importing Iranian saffron 41 countries

The most important countries purchased Iranian saffron:
Spain, UAE, Germany, Italy, France, Bahrain and Swiss

Saffron uses:
Foods
Cosmetics
Dye of textiles
Art affairs
Medicinal aspects, recently it has been considered for cancer therapy

New saffron products in Iran:

- ✓ Saffron cake
- ✓ Saffron jelly
- ✓ Saffron spice mixture
- ✓ Saffron butter mixture
- ✓ Saffron puffing
- ✓ Saffron beverage

Edaphic and climatic requirements:

Favorable in snowy and mild winters, hot and dry summers
Moisture: water requirement 300 mm rainfall in growing season
Temperature:
Min. coldness tolerable: -18°C
Max. tolerable temp: +40 °C
Soil: loamy sand texture and plenty of Calcium
pH: Neutral
Inoculation of corms with mycorrhiza increasing 26% corm growth
latitude : 32 to 36°N
Altitude:1000 meters from sea level

9 wild species of Crocus identified:

Crocus hausskenechtii Very similar to C.sativus

- ✓ C.sativus
- ✓ C. almehensis
- ✓ C. caspius
- ✓ C. speciosus
- ✓ C. michelsonii
- ✓ C. cancellatus
- ✓ C. biflorus
- ✓ C. gilanicus
- ✓ C. korolkowii

Development of flower and different stages of growth during an annual time: complete plant

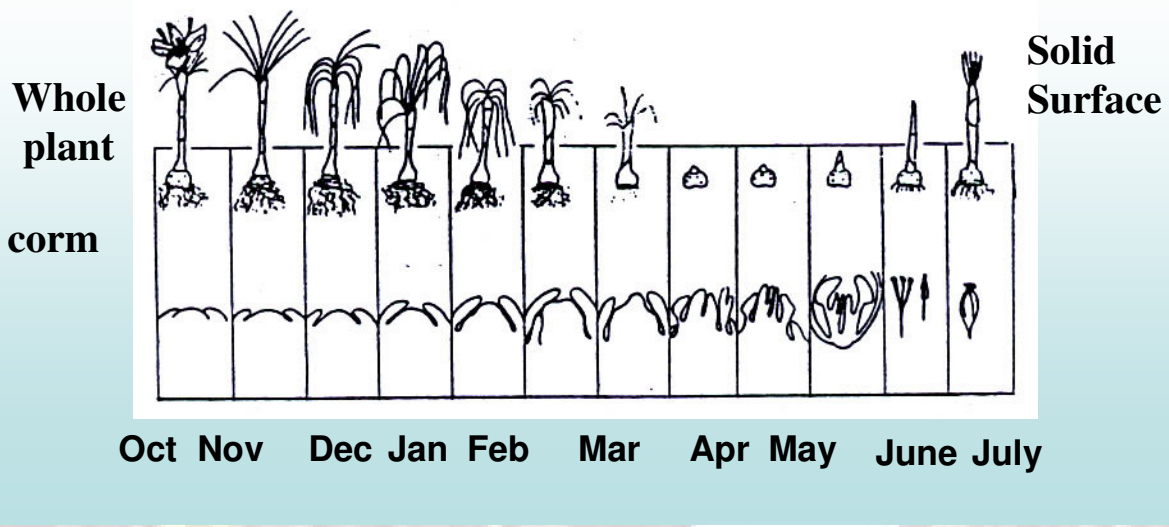
Flower bud

mid April to June, complete dormancy

June to July, leaves develop

July to August, flower and reproductive organs develop

- ✓ Primitive period: 50 days
- ✓ Development: 55 days
- ✓ Middle : 105 days
- ✓ Final: 30 days

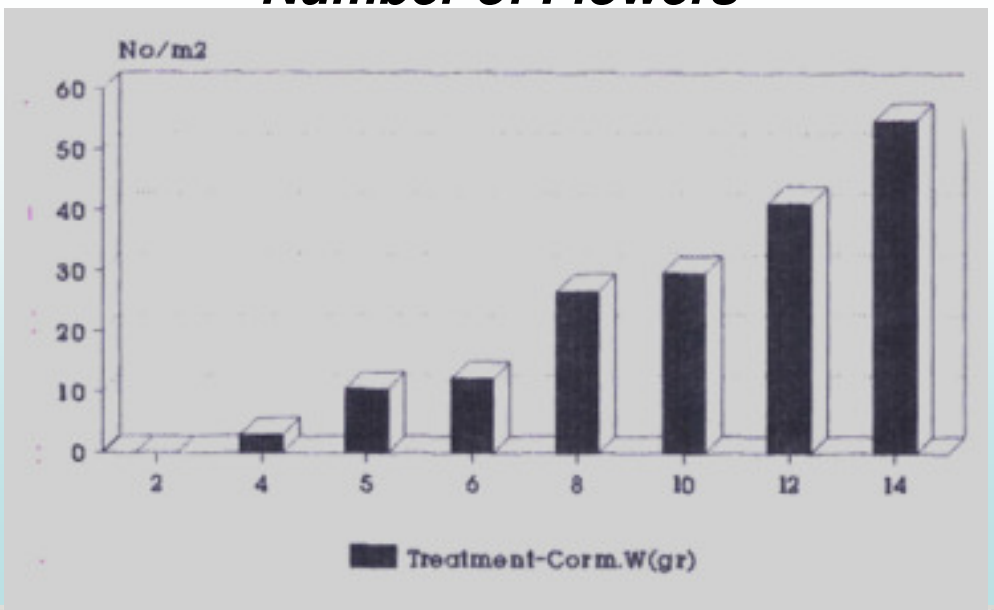


Corm selection:

Mean comparison of weight of corm on no. of saffron flowers

- Application of corms > 8 gr
- Approximate weight 8 gr

Number of Flowers



Planting date:

The most optimum time of planting, with respect to 3 years research and in 2 areas: early May, time of corm dormancy

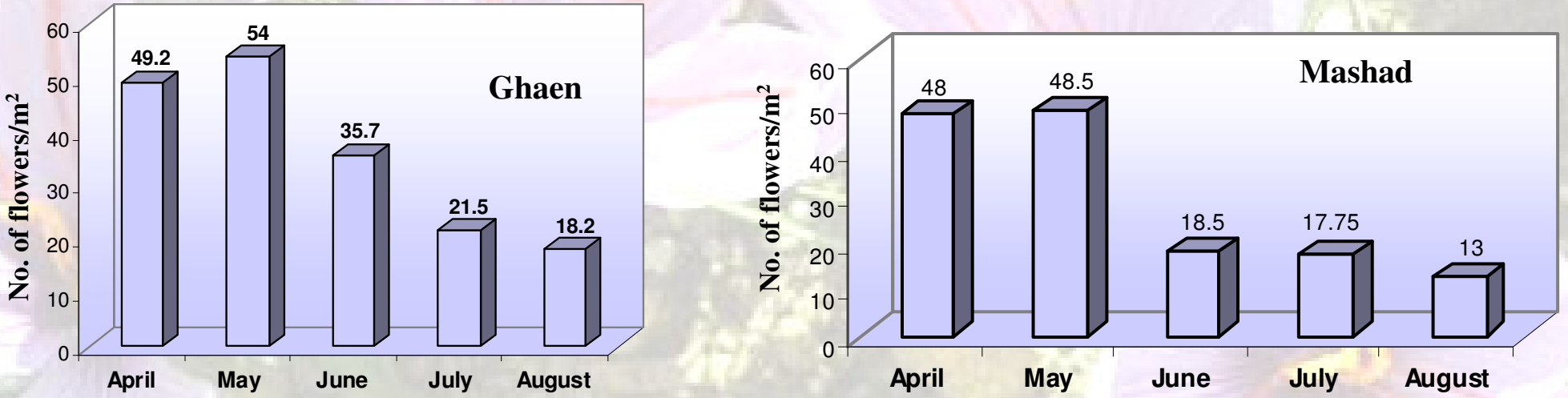


Figure: Effect of planting date on saffron flowering in Ghaen and Mashad

Plant density

50 Plants/m^2

One corm in each hole like a chain row and plant spacing (20×10cm) or (40×5cm)

It is recommended to be planted as a row crop

Multiple cropping

Saffron with black zira (2 to1)

2 rows saffron – 1 row black zira

Irrigation:

Once irrigation in July in addition to conventional irrigations is recommended.

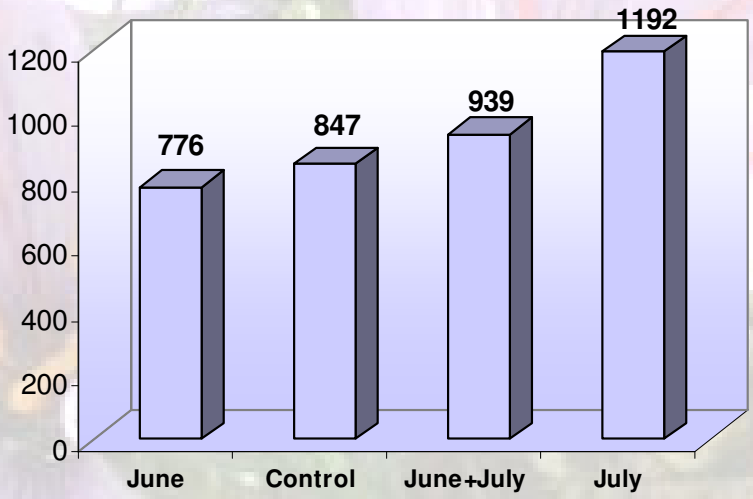


Figure: Effect of summer irrigation on flower weight/ha

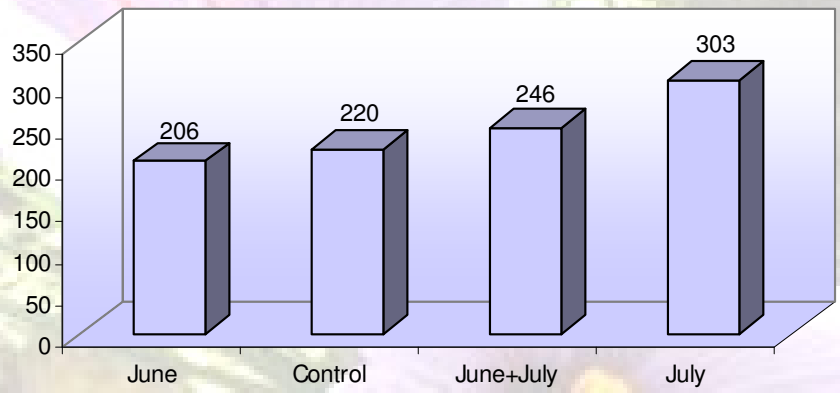


Figure: Effect of summer irrigation on no. of flowers/m^2

Water requirement:

About 3000 m^3

Once irrigation in July

Highest rate of requirement in March and April, 2.5 mm/day

The best time of irrigation in khorasan early September.

- Interval 15 days

Fertilization:

25 t cattle manure

Spraying once in February with liquid compound fertilizer (12% N, 8% P_2O_5 , 4% K_2O)

Fe, Zn, Mn, Cu chelates, 7/1000

1000 lit water / ha

33% yield increase

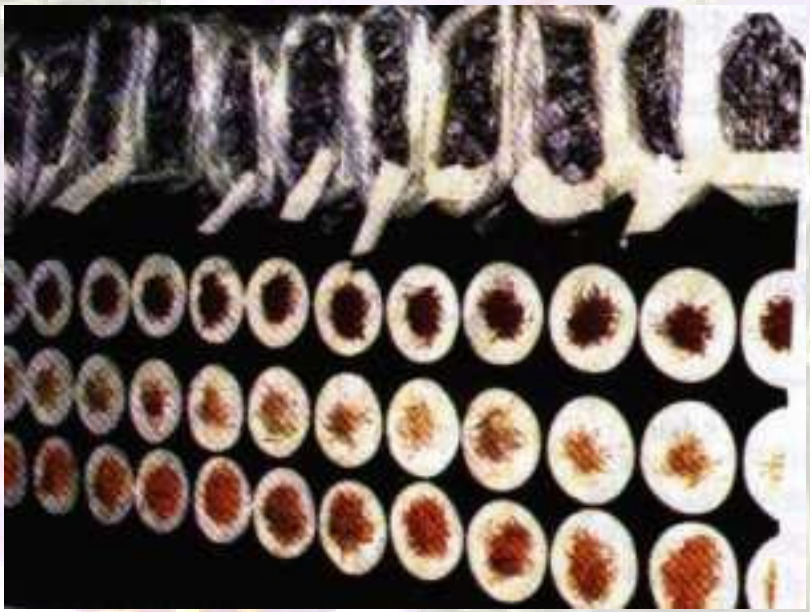
Or 100 kg Urea / ha after flower picking

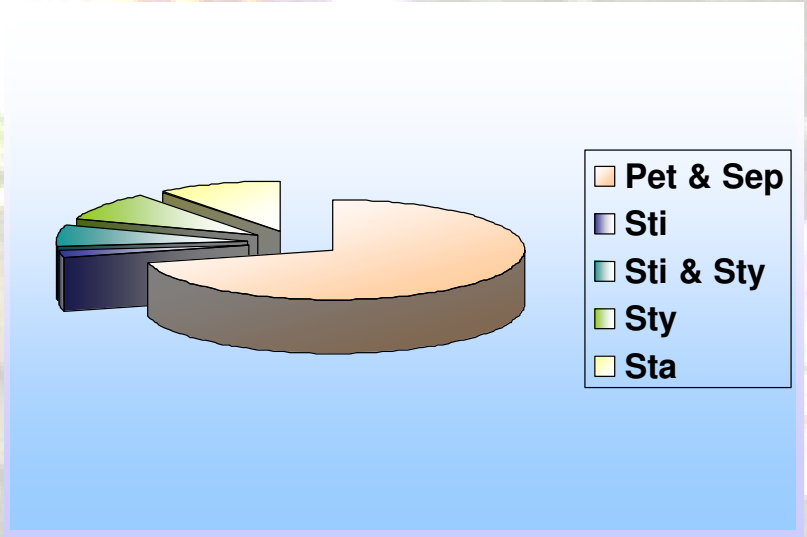
Weed control:

- Integrated weed control, as the saffron cultivation is organic
- Pre-emergence control of broad-leaved weeds sencor (Metribuzin)
- Narrow-leaved weeds after flower picking Gallant (Haloxy fepotexy- ethyl)
- Summer weeds in time of corm dormancy 2, 4-D and Round up (Glyphosate)

Saffron yield components:

- every kg of saffron flower
  - 2173 flowers
  - c.v. %9.73
- every kg of saffron flower
  - 47.93 gr fresh stigma
  - 9.48 gr dry stigma
  - 28.93 gr fresh style
  - 3.26 gr dry style
- ratio of stigma to style
  - 3:1
- every 78.5 kg saffron flower
  - equivalent to 170000 flowers
  - 1 kg dry saffron (style + stigma)





Digestibility of leaves for livestock:

1.5 t dry leaves/ha

Moderate digestibility for ruminants and supplements must be added

Pests:

mite Rhizoglyphus robini damages to corms prevention principles and disinfection of corms with acaricide Emite

rodents like mouse

control: Zinc phosphid, sodium cyanid, Zinc phosphorus, Brodyaxtum, cumatetralil, Cuma chlor

diseases:

no specific disease, Application of Benomyl 50% for corms.

Harvesting:

- for preservation of quality characteristics of saffron:

crocin (colour factor)

Picrocrocin (flavour factor)

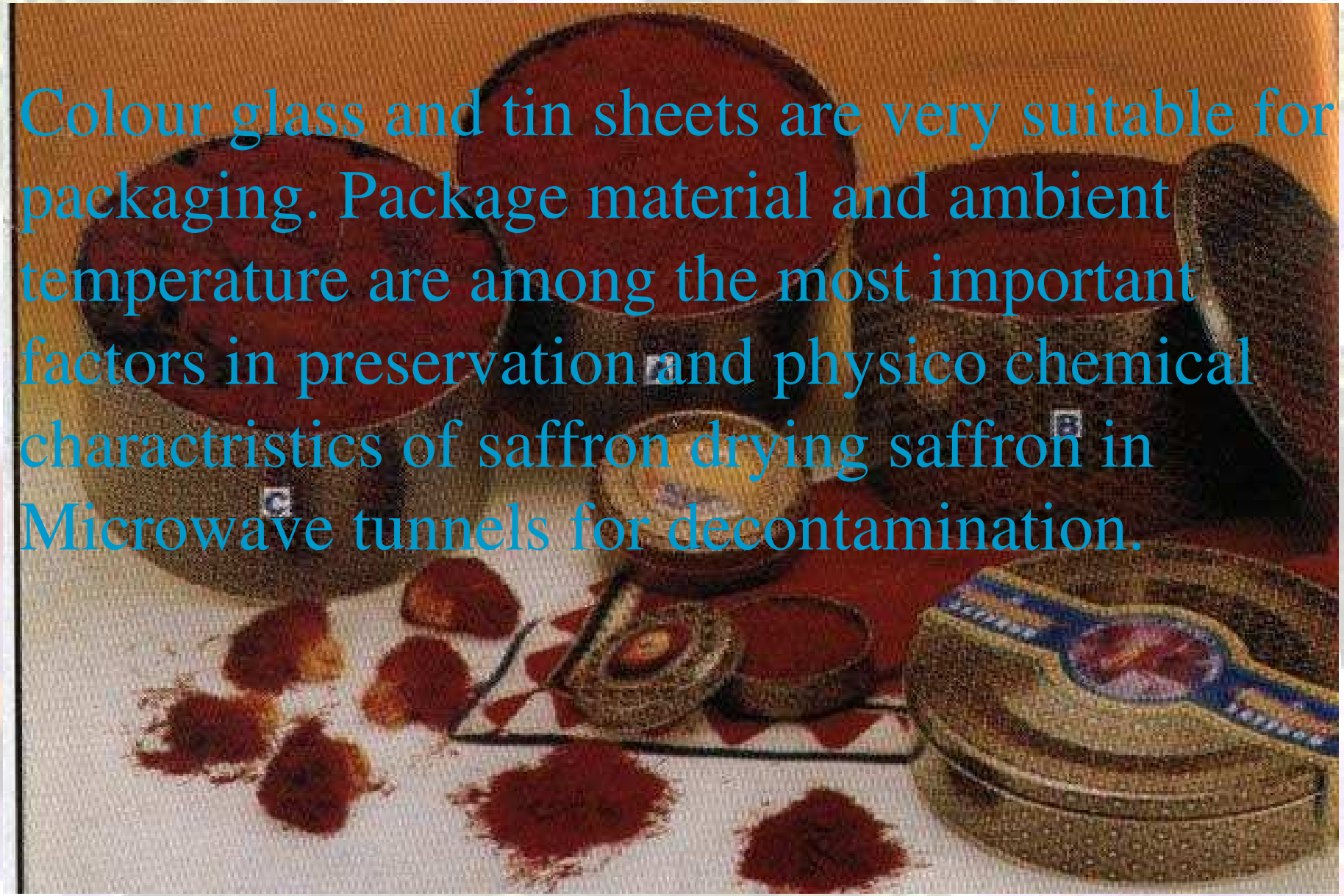
safranal (fragrance and odour)

- Picking flowers as blossom and its transportation in clean containers like plastic baskets and storage in cold places

Without light and microwave decontamination, vacuum 70°C oven, ordinary oven, and Spanish method (screen+heater) for better preservation of quality

storage:

preservation thickness 10 cm in 0°C for 7 days

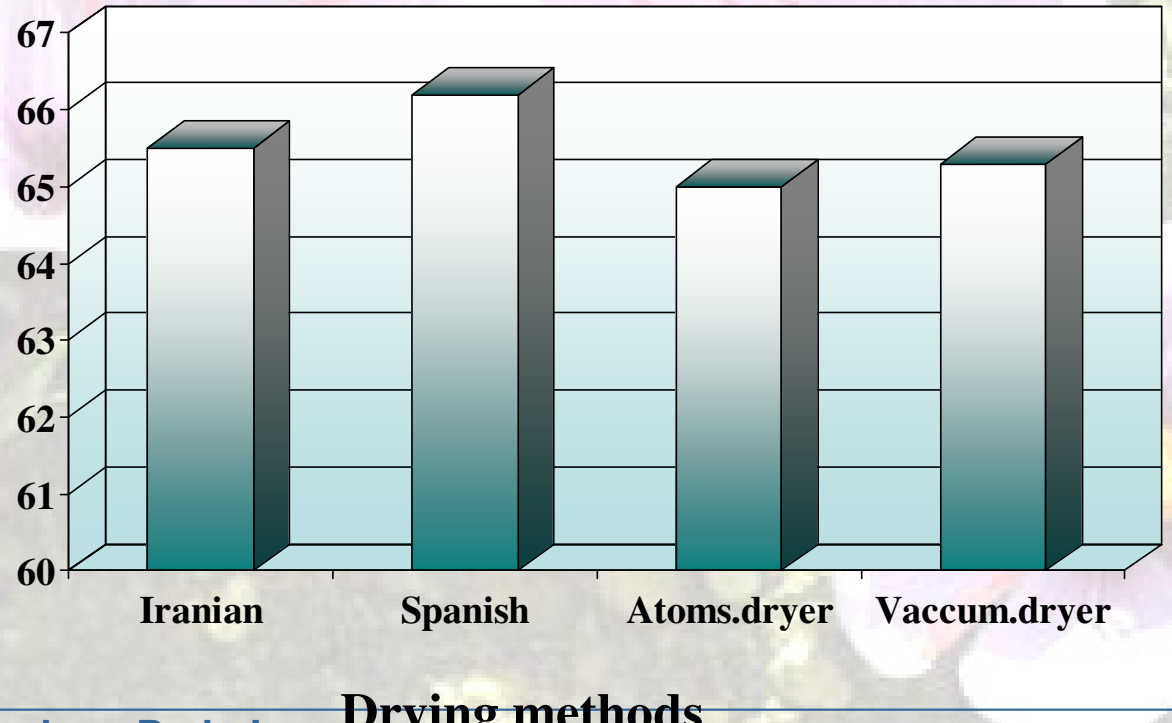


Colour glass and tin sheets are very suitable for packaging. Package material and ambient temperature are among the most important factors in preservation and physico chemical charactristics of saffron drying saffron in Microwave tunnels for decontamination.

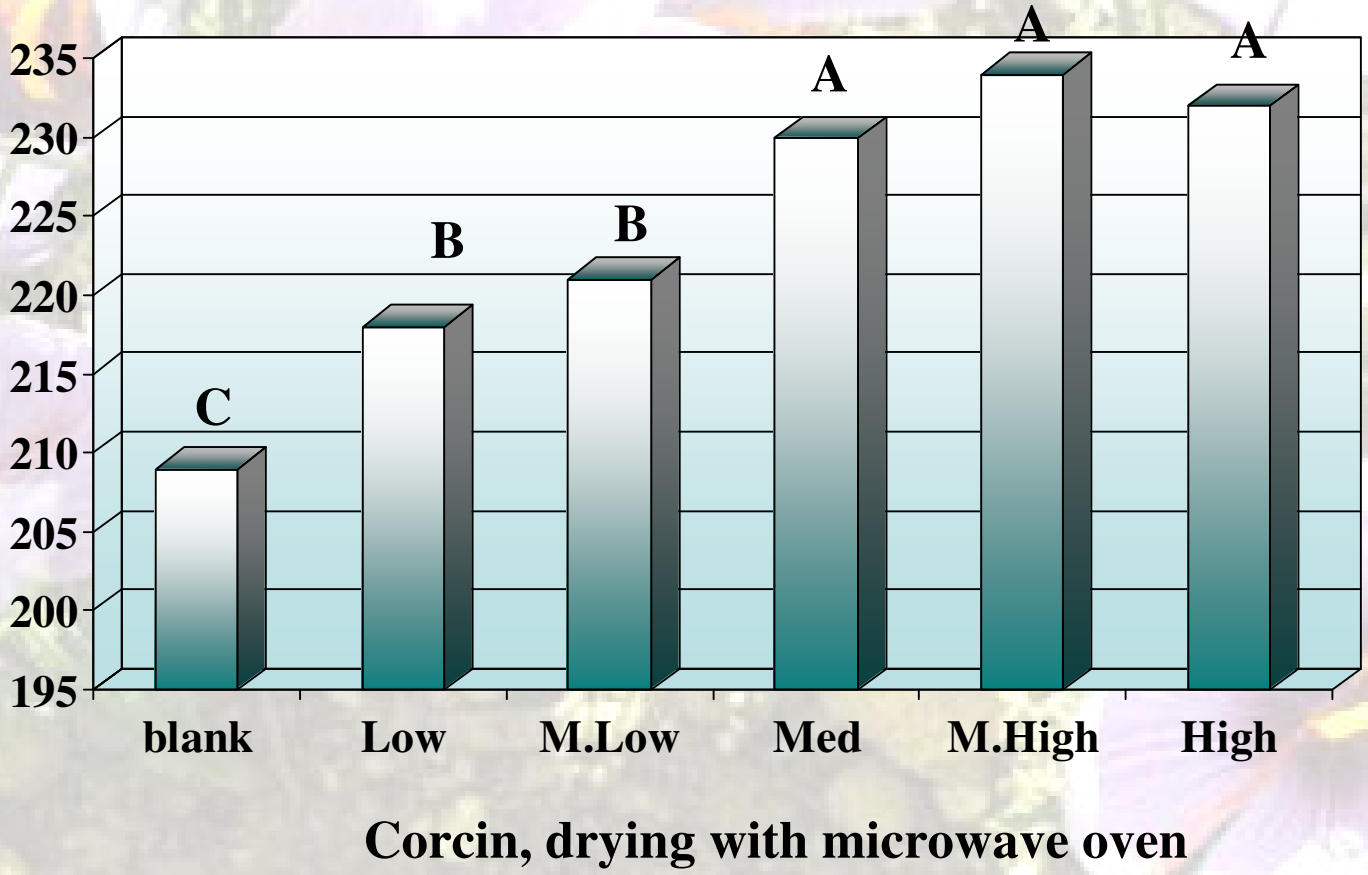
Effect of 4 methods of drying on colour strength of saffron

Result:

Drying saffron with cabinet driers with atm. pressure is favorable for colour, flavour and fragrance of saffron.



Comparison of colour strength of dried saffron with microwave.



Conclusion:

Yield average in Iran: 4.8 kg/ha considering corm sorting and choice of > 8 gr corms, corm disinfection, planting in May, Density 50 plants/m^2, water schedule with respect to the climate, fertilization for rate and time favourable, integrated weed control.

Shortening age of farms from 8 to 4 with high yield up to 10 kg/ha.

Thanks everybody for patience