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Studies the drying behaviour on varieties of onion

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Abstract
An experiment entitled "Studies on evaluation of different varieties of onion for dehydration." was conducted during year 2020-21 at Horticulture Research Scheme (Vegetable), Department of Horticulture, VNMKV, Parbhani. The experiment was laid out in Randomized Block Design for field research experiment and Completely Randomized Design for laboratory experiment with three replications and twelve varieties viz. Bhima kiran, Bhima Super, Bhima Dark Red, Bhima Light Red, Bhima Safed, Bhima Raj, Bhima Shakti, Bhima Shweta, Bhima Shubhra, Bhima Red, N-2-4-1, Phule Samarth. Analysis of variance revealed significant differences among the varieties in all characters.
Lowest browning index was recorded in variety Bhima Shubhra (7.54 mg/g) while maximum browning index was found in variety Bhima Raj (12.38 mg/g). Moisture content on wet basis maximum was recorded in variety Bhima Shweta (98.27-82.00%) however, minimum was recorded in variety Bhima Kiran (97.12-82.00%) and moisture content on dry basis highest was recorded in variety Bhima Shweta (56.87-7.33%) however, lowest was recorded in variety Bhima Kiran (33.72-4.56%). Minimum moisture ratio was recorded in variety Bhima Kiran (0.62%), while maximum was observed in variety Bhima Shweta (0.72%). Highest drying rate was observed in variety Bhima Dark Red (11.02 – 1.02 kg water /kg dry matter /hr) however, lowest was recorded in variety Bhima Kiran (4.17-0.56 kg water /kg dry matter /hr). Hence, on account of drying ratio, rehydration ratio and browning index, as compared to rest of the varieties of onion under studies the Bhima shubhra, Bhima Shweta and Bhima dark red varieties were more suitable for dehydration purposes.

Keywords: Dehydration, maximum, minimum, onion, recorded, varieties

Introduction
Onion (*Allium cepa* L.) is the most important underground bulbous vegetable crops grown in India. It is grows well in mild climate without extreme heat or cold or excessive rainfall. It is widely cultivated for internal consumption as well as for the export. Globally, the country occupies the second position after china in onion production with a share of around 14% (www.agriexchange.apeda.gov.in).
The large quantity of onion is used as fresh, however, some of the surplus quantities of onion available in the market are processed by dehydration and are meant mainly for export and armed forces (Pawar *et al*., 1988) [5]. Dehydration is the best way to preserve various forms of onion for future use and to increase self life. This involves drying or removing moisture from the onions. Dehydrated onions not require refrigerated storage as do frozen onions and contents of a container can be used some time after opening provided they are not dehydrated. The main advantages of dehydrated onions are that they are easy to store, being lighter in weight and smaller in bulk than fresh or other processed onions. They are cheap to pack compared with canned goods. The newest dehydration process appears to be a variation on the air-drying process and is based on the principle of vapor pressure differentials, using air circulated around the onions at relatively low temperatures to 'sweat' the water from the food.
Generally, White onion varieties are preferred for dehydration due to higher TSS and higher dry matter content. Some essential characteristics that should be present in onion cultivars suitable prior to drying are white coloured flesh, TSS 15-20%, high pungency, high insoluble solid, low ratio of reducing to non reducing sugar and lower browning during drying (Jones and Mann, 1963[3] and Saimbhi, 1970) [9]. Keeping in view the need to identify suitable varieties, the study was conducted to investigate the drying behaviour of onion varieties and their suitability for dehydration.

Material and Methods
An experiment entitled "studies on evaluation of different varieties of onion for dehydration" was conducted at experimental Farm, Horticulture Research Scheme (vegetable), Vasantrao

Naik Marathwada Krishi Vidyapeeth, Parbhani. (M.S.). This chapter outlines are specifics of the material used and procedures to be followed during the process of the investigations.

1. Moisture (%)

The reduction in moisture content of onion slices was recorded at an interval of one hour during drying process. The moisture content was calculated by using the following equation.

$$\text{Moisture content (\%)} = \frac{W1 - W2}{W1} \times 100$$

Where,
W1 = Initial weight of sample (gm)
W2 = Final weight of sample (gm)

2. Moisture ratio

The moisture ratio or dimensionless mass loss of samples during the drying process was calculated from the Lewis equation (Jayas *et al*., 1991) [2].

$$\text{Dimensionless mass loss} = \frac{M_t - M_e}{M_i - M_e}$$

Where M_t is the sample moisture content at time t, % wb (wet basis), m_e is the equilibrium moisture content, % wb and M_i initial moisture content, % wb.

3. Drying rate

The drying rate of sample was determined using the equation

$$\text{Drying rate} = \frac{W_{t+dt} - W_t}{dt}$$

Where W_t is the sample weight at time t, % wb (wet basis), dt is the time interval between two consecutive measurements.

4. Dehydration ratio

Dehydration ratio was calculated by taking the weights of sample before drying and the weight of sample after drying.

$$\text{Dehydration ratio} = \frac{W2}{W1} \text{ X } 100$$

Where, W2 =Weight of sample after drying
W1 =Weight of sample before drying

5. Rehydration ratio

Dehydrated slices were evaluated for rehydration ratio to find the reconstitution of dried sample using the following formula

$$\text{Rehydration ratio} = \frac{W2}{W1} \text{ X } 100$$

Where, W2 =Weight of rehydrated sample, g
W1 =Weight of the dehydrated sample, g

6. Browning Index

Browning index of dehydrated onion was determined by the hunter lab calorimeter. Instrument was initially calibrated with a black as well as with standard ceramic plate. The 3-dimentional scale L*, a* and b* was used. The L* is the lightness coefficient, ranging between 0 (black) to 100 (white), a* represents greenness and redness while b* represents yellowness and blueness, C represents croma value h represents hue angle.

$$\text{Browning index} = \frac{100\,(X - 0.31)}{0.17}$$

Where

$$X = \frac{a + 1.75\,L}{5.645\,L + a - 0.3012\,b}$$

Statistical analysis

The data on various observations during the course of investigation were statistically analyzed as suggested by Panse and Sukhatme (1967) [4].

Result and Discussion

1. Moisture (%)

The data regarding to the moisture content on wet basis maximum was recorded in Table No. 1 in variety Bhima Shweta (98.27-82.00%) however, minimum was recorded in variety Bhima Kiran (97.12-82.00%). The data pertaining to the moisture content on dry basis highest was recorded in variety Bhima Shweta (56.87-7.33%) followed by Bhima Safed (50.98-6.69%) and Bhima Dark Red (50.02-6.14%). However, lowest was recorded in variety Bhima Kiran (33.72-4.56%). These results are in close conformity with results obtained by Djaeni *et al*., (2017) [1] showed that the initial moisture content was observed (89.97%) wet basis and moisture ratio of 9 on dry basis. moisture contents removal increasing with increasing air temperature and drying time also.

2. Moisture ratio

The data regarding to the moisture ratio significantly minimum moisture ratio was recorded in Table No. 2 in variety Bhima Shakti and Bhima Kiran (0.62%), followed by in Bhima super and Bhima Raj (0.63%) while, maximum was observed in variety Bhima Shweta (0.72%). These results are in close conformity with results obtained by Revaskar *et al*., (2014) [8] moisture diffusivity is affected due to the shrinkage, moisture contents and temperature of material. Moisture ratio decreasing continuously showed that diffusion has internal mass transfer.

3. Drying rate

The data in respect to the drying rate presented in Table No.1 significantly highest was observed in variety Bhima Dark Red (11.02 – 1.02 kg water /kg dry matter /hr) however, lowest was recorded in variety Bhima Kiran (4.17-0.56 kg water /kg dry matter /hr). These results are in close conformity with results obtained by Revaskar *et al.*, (2014) [8] reported that the entire drying process occurred in falling rate period and constant rate period was not observed.

4. Rehydration ratio

The data regarding to the rehydration ratio, maximum dehydration ratio was presented in Table No. 2. The data regarding to the rehydration ratio, highest rehydration ratio was recorded in variety Bhima Shubra (5.74) followed by Bhima Super, (5.66). However, lowest rehydration ratio was recorded in variety Bhima light red (5.42).

5. Dehydration ratio

The data regarding to the dehydration ratio, maximum dehydration ratio was presented in Table No. 2. The data regarding to the dehydration ratio, maximum dehydration ratio was recorded in variety Bhima Shubra and Bhima Dark red (7.14) followed by Bhima Shewta, Bhima light red and Bhima Red (6.94). However, minimum dehydration ratio was recorded in variety Bhima Kiran and (6.25). Our results are in close conformity with results obtained by Djaeni *et al*., (2017) [1], Rayar (2014) [7] and also Priyanka (2014) [6] reported that the moisture content of dried onion sample increased throughout storage period 30 days and dehydration ratio of slices was observed high in onion sample dried in cabinet and microwave drying.

6. Browning index

Data in respect of browning index of dehydrated onion showed in Table No.2 significant difference among varieties. Minimum browning index was recorded in variety Bhima Shubhra (7.54 mg/g) while maximum browning index was found in variety Bhima Raj (12.38 mg/g). Our results are in confirmation with the findings of Djeani *et al.*, (2017) [1] reported that the colour changes of onion powder drying. Browning of onion influenced by the temperature and drying time. Browning value decreased indicated that the colour changes red into brown during drying.

Table 1: Moisture, Drying Rate of different varieties of onion.

Treatment Symbol	Variety	Moisture (% wb)	Moisture (% db)	Drying rate (kg water /kg dry matter /hr)
T_1	B. kiran	97.12-82.00	33.72-4.56	4.17-0.56
T_2	B. super	97.42-83.00	37.70-4.88	8.51-0.77
T_3	B. Dark Red	98.04-86.00	50.02-6.14	11.02-1.02
T_4	B. Light Red	97.70-84.00	42.40-5.25	7.47-0.69
T_5	B. Safed	98.08-87.00	50.98-6.69	9.98-0.42
T_6	B. Raj	97.35-83.00	36.71-4.88	9.80-0.15
T_7	B. Shakti	97.26-82.00	35.55-4.56	4.09-0.58
T_8	B. Shweta	98.27-88.80	56.87-7.33	9.26-0.69
T_9	B. Shubhra	97.90-85.00	46.62-5.67	9.52-0.57
T_{10}	B. Red	97.84-85.00	45.30-5.67	8.89-0.37
T_{11}	N-2-4-1	97.50-84.00	39.06-5.25	7.85-0.32
T_{12}	P. Samarth	97.87-86.00	45.99-6.14	10.34-0.38

Table 2: Moisture Ratio, Dehydration Ratio, Rehydration Ratio and Browning Index of different varieties of onion.

Treatment Symbol	Variety	Moisture Ratio	Dehydration ratio	Rehydration ratio	Browning Index (mg/g)
T_1	B. kiran	0.62	6.25	5.40	9.38
T_2	B. super	0.63	6.58	5.66	9.68
T_3	B. Dark Red	0.68	7.14	5.54	10.99
T_4	B. Light Red	0.65	6.94	5.42	9.01
T_5	B. Safed	0.70	6.76	5.46	8.66
T_6	B. Raj	0.63	6.41	5.65	12.38
T_7	B. Shakti	0.62	6.58	5.46	9.70
T_8	B. Shweta	0.72	6.94	5.58	8.61
T_9	B. Shubhra	0.66	7.14	5.74	7.54
T_{10}	B. Red	0.67	6.94	5.52	8.16
T_{11}	N-2-4-1	0.65	6.41	5.48	11.82
T_{12}	P. Samarth	0.68	6.58	5.45	9.80
SE ±		0.24	0.009	0.009	0.34
CD @ 5%		0.73	0.026	0.026	1.00

(B- Bhima, P- Phule, T- Treatments)

Conclusion

In respect of moisture content on wet basis maximum moisture content was recorded in variety Bhima Shweta (98.27-82.00%), however, minimum was recorded in variety Bhima Kiran (97.12-82.00%) and moisture content on dry basis, highest was recorded in variety Bhima Shweta (56.87-7.33%) and lowest in variety Bhima Kiran (33.72-4.56%). Minimum moisture ratio was recorded in variety Bhima Kiran (0.62%), while maximum was observed in variety Bhima Shweta (0.72%). Highest drying rate was found in variety Bhima Dark Red (11.02 – 1.02 kg water/kg dry matter /hr), however, lowest in variety Bhima Kiran (4.17-0.56 kg water /kg dry matter /hr). On the basis of quality parameter and on account of drying ratio, dehydration ratio and browning index, as compared to rest of the varieties of onion under studies, the Bhima shubhra, Bhima Shweta and Bhima dark red varieties were more suitable for dehydration purpose. However, it needs to be confirmed by conducting the same investigation.

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References

1. Djaeni M, Arifin UF, Sasongko SB. Physical-chemical quality of onion analyzed under drying temperature. International Conference on Chemistry, Chemical Process and Engineering. Published by AIP Publishing. https://doi.org/10.1063/1.4978114. Indonesia; c2017.
2. Jayas DS, Chekowski S, Pabis S, Muir WE. Review of thin-layer drying and wetting equations. Drying Technology. 1991;9(3):551-588.
3. Jones HA, Mann LK. Onion and their allies. Leomard Hill Book Ltd, London; c1963.
4. Panse VS, Sukhate PV. Statistical Methods for Agricultural Workers, ICAR, New Delhi; c1984.
5. Pawar VN, Singh NI, Der DK, Kulkarni DN, Injle UM. Solar drying of white onion flakes. Indian Food Packer. 1988;42(2):15-28.
6. Priyanka. dehydration of onion (Allium cepa linn.), nutritional composition and development of value added products. (Master's Thesis). University of agriculture sciences Bangalore Retrived from https://krishikosh.egranth.ac.in/dispbitstream?han=1/58. Accessed on April 20, 2021.
7. Rayar SM. Effect of pretreatments and varietieson dehydration of red onion. (Master's Thesis). University of Horticulture sciences, Bagalkot. Retrived from https://krishikosh.egranth.ac.in/dispbitstream?han=1/58. Accessed on May 1; c2021.
8. Revaskar VA, Pisalkar PS, Pathare PB, Sharma GP. Dehydration kinetics of onion slices in osmotic and air convective drying process. Research Agriculture engineering. 2014;60(3):92-99.
9. Saimbhi MS, Padda DH, Singh G. Evaluation of onion varieties for dehydration traits. Journal of Food Science Technology. 1970;8:149-150.