RESEARCH PAPER — FOOD SCIENCE RESEARCH JOURNAL
ISSN-0976-1276 ■ Visit us : *www.researchjournal.co.in*
Volume 11 | Issue 2 | October, 2020 | 195-201
DOI : 10.15740/HAS/FSRJ/11.1/195-201

Evaluation of sensory attributes of cauliflower slices under various pre-treatment and tray drying and microwave power drying condition

Vipin Kumar Verma, Devendra Kumar, Rupendra Singh, Pankaj Kumar and Devendra Singh

Cauliflower is one of the most important winter vegetable crop of india. Dehydrated cauliflower can be used to enhance the taste and nutritional value of various product such as vegetable soup, canned and extruded products etc.Experimental study was conducted to evaluate cauliflower slices using tray drying and microwave power drying techniques. Pre treatment of cauliflower slices as unblanched , blanched and blanched with kms and dried at different temperature(45, 55 and 65°C) and micro wave at different power level (20 W,40 W and 60 W).The physio-chemical characteristics were evaluated just after preparation of cauliflower slices. Sensory characteristics (colour, flavour, taste, texture and overall acceptability) were evaluated for pre-treated cauliflower slices which dehydrated in tray dryer at 45, 55 and 65°C temperature and in microwave power dryer at 20, 40 and 60 W power. Sensory evolution was done using hedonic rating test method to measure the consumer acceptability. Results showed that highest score was obtained as 7.9 for colour at 65°C in KMS blanched condition whereas highest score for taste was obtained as 7.9 at 65°C in blanched condition in tray dryer. The maximum value of flavour (8.0) was obtained at 65°C in blanched condition whereas highest value of texture (7.9) at 65°C in blanched condition in tray dryer in microwave dryer, the highest values of colour (7.9) was obtained at 60W in kms blanched condition where as highest value of taste (7.9) at 60 W in unblanched conditions .The highest score of flavour (8.1) and texture (7.9) were found at 60 W in kms blanched condition in microwave power drying. Overall acceptability score was highest (7.92) in microwave power drying than tray drying (7.85) in kms blanched sample at 60 W power and 65°C temperature drying, respectively. Microwave power drying was found most suitable for kms blanched cauliflower slices at 60 W power level.

Key Words : Cauliflower slices, Microwave, Tray dryer, Colour, Taste, Flavour, Texture, Overall acceptability

How to cite this article : Verma, Vipin Kumar, Kumar, Devendra, Singh, Rupendra, Kumar, Pankaj and Singh, Devendra (2020). Evaluation of sensory attributes of cauliflower slices under various pre-treatment and tray drying and microwave power drying condition. *Food Sci. Res. J.,* **11**(2):195-201, **DOI:10.15740/HAS/FSRJ/11.2/195-201**.

MEMBERS OF RESEARCH FORUM

Author for correspondence :
Vipin Kumar Verma, Dr. Bhim Rao Ambedkar College of Agricultural Engineering and Technology, **Etawah (U.P.) India**
Email: vipincaet79@gmail.com

Associate Authors' :
Devendra Kumar, Rupendra Singh Pankaj Kumar and Devendra Singh, Dr. Bhim Rao Ambedkar College of Agricultural Engineering and Technology, **Etawah (U.P.) India**
Email:devendrachaturvedi2008@gmail.com; rupendra.singh8195@gmail.com,pankajkumarpk055@gmail.com and dsinghcsau@gmail.com

INTRODUCTION

Cauliflower is one of the vegetable in the species Brassica olera of the common cabbage. It is more difficult to survive because it does not tolerant the heat or cold as well. For this reason cauliflower is usually grown at consistently cool temperature. Cauliflower is member of the cabbage originating sometime after the begin of the common Era (the birth of Christ) in the Mediterranean

and Asia minor. Cauliflower took some time to move west arriving in France and England in the early 17th century. Its introduction to the United States has been fairly recent. As with broccoli it was much more popular in ethnic communities especially with and was not developed commercially until the 1920s. Cauliflower still isn't as popular as broccoli. Mahn and Reyes (2012), reported that Broccoli was originally cultivated in the ancient Italy and then it was transported to England from Northern Mediterranean region in the mid-18th century. Currently it is grown and consumed worldwide. The top ten countries which produce broccoli are China, India, Italy, Mexico, France, Poland, United States, Pakistan, Germany, and Egypt. Cauliflower was introduced in india in 1822. (Lund *et al.,* 1972).World production of cauliflower is 13.5 million tonnes. India is the highest producer of cauliflower, its productivity is lower than average (Mudgal and Pandey, 2008). Nutritional value of cauliflower as per USDA National nutrients data base (2012) was reported as – Energy 104 kJ (25 kcal), Carbohydrates 5g, sugars 1.9g, dietary fibre 2g, fat 0.3g, protein 1.9g, vitamin B_6 14 per cent, (0.184mg), vitamin C 58 per cent, (48.2mg), calcium 2 per cent, (22mg), water 92 g. Cauliflower is one of the most important winter vegetable of India. India produces 8668000 MT of cauliflower with area 453000 ha (NHB 2017-18). The major cauliflower producing states are Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana and Maharashtra. The edible position of cauliflower is 45 per cent. The estimated post harvest loss per hectare in India is about 49 per cent (Sehgal, 1999). Application of convective drying for cauliflower improves the quality of final product (dried cauliflower). Cauliflower is low in fat, low in carbohydrates but high dietary fibre, folate, water potassium, vitamin C and processing a high nutritional density. Cauliflower contains several phytochemicals, common in the cabbage family that may be beneficial to human health. Sulfoarphane, a compound released when cauliflower is chopped or chewed, may protect against cancer. Other glucosinolates carotenoids indole-3-carbinol, a chemical that enhances DNA repair, and acts as an estrogen antagonist slowing the growth of cancer cells. Intake of cauliflower has been associated with reduced risk of aggressive prostate cancer. Cauliflower can be roasted, boiled, fried, steamed, or eaten raw. Steaming or microwaving has better preserves anticancer compounds than boiling. Preservation methods start with the complete analysis and understanding of the whole food chain, including growing, harvesting, processing, packaging, and distribution; thus an integrated approach needs to be applied. It lies at the heart of food science and technology and it is the main purpose of food processing (Rahman, 2007). Mudgal and Pandey (2007) reported that processing can be alternate for extending the shelf-life. Dehydrated cauliflower can be used to enhance the taste and nutrients value of various product such as vegetable soup, canned products, extruded products etc. Radhakrishnan (1999) reported that value of fruits and vegetable processing in india is hardly 2 per cent of the total production whereas countries such as Thailand, Brazil, Philippines and Malaysia process 30 per cent, 70 per cent,78 per cent and 83 per cent of their product, respectively. Low carbohydrates dieters can use cauliflower as a reasonable substitute for potatoes or rice; while they can produce a similar texture, or mouth feels they lack. A controlled multi-hurdle could be applied without affecting the sensory and nutritional properties. Over the last decade, use of this approach has led to important ingredients of innovative technologies for obtaining shelf-stable''intermediate price products'' (IMP) storable for 3-8 months without refrigeration. These new technologies are based on combination of different preservation methods with synergistic effects. Among the newer techniques for preservation of such product treatment with ionizing radiation is one of the most promising. The use of unhealthy and unsafe chemical and practices can possibly replaced by the use non-residual feature of ionizing radiation treatments. Gamma irradiation has long been employed for decontamination and or sterilization of dehydrated vegetables (Sharma *et al.,*2009). Sutar and Prasad (2008) reported that many molecules (such as water) are electric dipoles, meaning that they have a positive charge at one end and a negative charge at other and, therefore, rotate as the rotating molecules hit other molecules and put them into motion. However, use of radiation technology to minimize or avoid the use of other hurdles has been very limited. The application of microwaves has been increasing interest in processing of foods and bio-commodities over past two decades. During microwave drying process local pressure and temperature rise continuously even though the loss factor of treated materials decrease with the reduction of moisture content. Although these increases of pressure and temperature can speed up the drying process, they

may cause side effects such as bio-value degradation, physical damages and non-uniform temperature distribution in treated materials in microwave heating or drying. Microwave-emitted radiation is confined within the cavity and there is hardly heat loss by conduction or convection so that energy is principally absorbed by water in the material, causing temperature to raise, some water to be evaporated and moisture level to be reduced. A domestic microwave oven works by passing microwave radiation, usually at a frequency of 2450 MHz (a wavelength of 12.24 cm), through the food. Water, fat, and sugar molecules in the food absorb energy from the microwave beam in a process called dielectric heating. Neelavathi *et al*. (2013) studied the dehydration process of cauliflower in 3 cvs. Water steam and microwave blanching at 90$\pm$2^{o}C. Steam blanching retained higher level of quality and ascorbic acid followed by microwave. Chua *et al*. (2001) reported that drying of food involves complete removal of water under controlled conditions in such away that in addition to preservation, it helps to decrease the weight and bulk of food. Drying thus, results in great economy in storage, packing and transport of food. Attiyate (1979) studied on microwave heating under vacuum to produce orange powder for a natural instant fruit drink. It showed good quality and processing advantage in terms of retention of vitamins, orange flavour, colour, aroma, shorter, process cycles and low process temperature. Decareau and Peterson (1986) reported that microwave drying has gained popularity as an alternative drying method in the food industry because it is rapid and energy efficient compared to conventional hot air drying. Kalse *et al*. (2012) evaluated quality characteristics of onion slices using microwave drying technique. It is found that the mass reduction and water loss increased with increase of power level. The moisture diffusivity varied in the in the range of '' to 6.491 x 10^{9} to 6.491 x 10^{8} m^{2}/s''. Quality of dried product in respect to colour, rehydration and water activity was superior. Saini and Singh (1994) studied the newly developed and existing tomato caltivars for physio-chemical change during ripenig. Colour changes are attributed by the ripening and represent a key attribute, along with texture, for the determination of eating quality. Ahmad *et al*. (2005) evaluated physico-chemical properties sensory characteristics and textural analysis of papaya and tomato fruit bar. Ripe papaya (Red lady) and tomato (Naveen) pulp were blended for preparation of fruit bar in the ratio 75:25 on wight basis. It was observed that TSS in the range of 78.1-78.8^{o} Brix and vitamin C content was found as 40.5-41.4 mg/100g. During four months storage change in colour and texture were not uniform for all treatments. 1.5% of each pectin + starch was effective in improving the texture during four month storage.Verma and Kumar (2019) evaluated physico-chemical characteristics of cauliflower slices at different pre-treatment and drying condition. Result showed that moisture loss increased from cauliflower with increased in power of microwave and time of drying. The drying time was dependent on initial size of cauliflower, drying air temperature and velocity but, rehydration ratio was significantly affected by the combined effect of temperature and air flow velocity. Microwave power drying is found most suitable for kms blanched cauliflower slices at low power level. Ranganna (1994) reported that quality is ultimate creation of the desirability of any food product to the consumer. Overall quality depends on nutritional and other hidden attributes and sensory quality. Senses quality is a combination of different sensor for perceptions coming into play in chewing and eating a food. Vijaynand *et al.* (2000) observed that guavas fruit bar prepared from a new process showed better texture, sensory quality and storage stability. Sinha *et al.* (2013) evaluated micro bid and sensory stability of cauliflower. Cauliflower were preserved by combinations of hurdles in blanching through different treatments followed by dipping into 0.25 per cent potassium meta bisulphite for 10 minutes. The successful blanched treatment was B6. 100^{o}C for 60 sec. followed by dipping into 0.25 per cent kms for 10 minutes. P4/T2 treatment was scored highest in sensory evaluation with 8.0 overall acceptability in 180 days of storage period. Ali *et al*. (2020) studied effect of storage conditions on quality attributes of cauliflower slices. Result showed that organoleptic quality of packed cauliflower can be retained excellently where as control curds without packaging in plastic rated poor after 14 and 21 days. Shelf- life studies of cauliflower at freezing storage (-18^{0}C) were acceptable upto 90 days of storage. Fresh cauliflower offers a serious problem during storage, transport and marketing. In order to prevent such spoilage and extend its shelf life, drying technique may preserved the cauliflower. About 30-40 per cent of food in both devolving and developed countries is roughly lost to waste. North America and Oceania stand the highest with 1520 kcal per person per day lost or wasted from farm to fork among

all regions (Lipinski *et al*., 2013). Therefore, the study was under taken to evaluate sensory attributes of cauliflower slices under various pre-treatment and tray drying and microwave power drying condition.

METHODOLOGY

Studies were carried out to evaluate physico-chemical characteristics of pretreated cauliflower slices using tray dryer and microwave dryer at 45, 55 and 65°C and 20,40 and 60 watt, respectively. Pre-treatment of cauliflower samples was done as unblanched, blanched and kms blanched condition. Sensory attribute were colour, taste, flavour, texture and overall acceptability were also evaluated for cauliflower slices. Samples were packed in HDPE bags. All samples were kept at ambient room temperature.

Cauliflower fresh and good pieces were sliced with help of knife. The slices of cauliflower were washed in tap water and the sample was drained to remove the excess water for unblanched sample. After washing, the sliced cauliflower pieces were blanched by tying them in muslin cloth and dipping the sample in boiling water for 5 minutes. Similarly sliced cauliflower pieces were blanched with sodium benzoate by tying them in muslin cloth and dipping the sample in boiling water for 5 minutes. The blanched with sodium benzoate sample were cooled immediately by keeping them under flowing water to prevent over cooking of the sample and drained to remove the excess water for blanched (1% sodium benzoate) sample. The dried slices were obtained after tray drying. The experiment for the samples was carried out until constant weight achieved using inlet hot air temperature 45, 55 and 65°C. The pre-treated cauliflower slices was dried in a microwave dryer. Drying was carried out at three different microwaves -generation power being 20, 40 and 60 watt and two pre-treatment. The sample of cauliflower slices was dried simultaneously, in order to ensure uniform drying conditions. After the dried cauliflower slices were analyzed for different physio-chemical properties and sensory attributes. Three replications of each pre-treated sample was performed for thin layer drying in tray dryer and dielectric heating to preset microwave output power.

Sensory quality attributes such as colour, taste, flavour, texture and overall acceptability of the product of cauliflower slices was evaluated as recommended by (Ranganna, 2001). Hedonic rating test method was used for the evaluation. This test measure the consumer acceptability. A panel consisting of members of different age groups having different eating habits was constituted to evaluate the quality through properly-planned experiment. The panelists were selected from the staff and student of the college. Samples were served to the panelist and they were asked to rate the acceptability of the product through the sense of organs. Different attributes *viz.,* colour, taste, flavour, texture were rated on the basis of hedonic scale ranging from 1 (extremely dislike/most undesirable) to 9 (extremely like / most desirable). A test proporma was also prepared and given to each panel member for the evaluation.

OBSERVATIONS AND ASSESSMENT

Sensory characteristics (colour, flavour, taste, texture and overall acceptability) were evaluated for pretreated cauliflower slices which dehydrated in tray dryer at 45°C, 55°C and 65°C temperature and in microwave dryer at 20W, 40W and 60W power. Pre-treatment of cauliflower slices was performed as unblanched, blanched and kms blanched condition. Sensory attributes evaluated of fresh pretreated cauliflower slices which dehydrated through tray drying and microwave drying at different temperature and power level. Results showed that The score of sensory characteristics was increased with increase of temperature in all pretreatment of cauliflower slices samples in tray drying condition.The highest value (7.9) of colour was observed at 65°C in KMS blanched condition and lowest value (6.1) at 45°C in unblanched condition in tray dryer. The highest value of taste (7.9) was observed at 65°C in blanched condition and lowest value (6.0) at 45°C in unblanched condition in tray dryer. The highest value of flavour (8.0) was observed at 65°C in unblanched condition and lowest value (6.1) at 45°C in KMS blanched condition in tray dryer. The highest value of texture (7.9) was observed at 65°C in blanched condition and lowest value (6.1) at 45°C in blanched condition in tray dryer. Overall acceptability (7.85) was observed maximum in kms blanched condition as compared to unblanched and blanched pre-treatment condition of samples in tray dryer. The score of sensory attributes was also increased with increase of power level in all pre- treatment of cauliflowers slices in microwave drying condition. In microwave dryer, the highest value of colour (7.9) was observed at 60W in KMS blanched condition and lowest value (6.1) at 20W in blanched

condition. The highest value of taste (7.9) was observed at 60W in unblanched condition and lowest value (6.3) at 20 W in KMS blanched condition in microwave dryer. The highest value of flavour (8.1) was observed at 60W in KMS blanched condition and lowest value (6.1) at 20W in unblanched condition in microwave dryer. The highest value of texture (7.9) was observed at 60W in KMS blanched condition and lowest value (6.5) was observed at 20W in blanched condition in microwave dryer. Study revealed that overall acceptability score was obtained highest (7.92) for microwave drying in kms blanched samples at 60W power level. Kms blanched cauliflower slices gave the highest overall sensory score as 7.92 at 60W microwave power level.

Table 1: Sensory characteristics of pretreated fresh cauliflower slices using tray dryer

Pretretments	Sensory characteristics	Temperature in °C		
		45°C	55°C	65°C
Unblanched	Colour	6.1	69	7.9
	Taste	6.0	6.7	7.8
	Flavour	6.2	7.6	8.0
	Texture	6.3	7.2	7.5
	Overall acceptability	6.15	7.1	7.80
Blanched	Colour	6.1	7.2	7.8
	Taste	6.2	7.3	7.9
	Flavour	6.3	7.1	7.7
	Texture	6.1	7.3	7.9
	Overall acceptability	6.17	7.22	7.83
KMS blanched	Colour	6.1	6.9	7.9
	Taste	6.3	7.1	7.8
	Flavour	6.1	7.3	7.9
	Texture	6.2	7.2	7.8
	Overall acceptability	6.17	7.12	7.85

Table 2: Sensory characteristics of pretreated fresh cauliflower slices using microwave power dryer

Pretreatment	Sensory characteristics	Power in W		
		20 W	40 W	60 W
Unblanched	Colour	6.2	6.9	7.8
	Taste	6.5	7.1	7.9
	Flavour	6.1	7.2	7.8
	Texture	6.5	6.9	7.7
	Overall acceptability	6.32	7.02	7.8
Blanched	Colour	6.1	6.9	7.5
	Taste	6.4	7.3	7.9
	Flavour	6.2	7.2	7.8
	Texture	6.4	6.9	7.7
	Overall acceptability	6.28	7.07	7.72
KMS blanched	Colour	6.8	7.1	7.9
	Taste	6.3	7.6	7.8
	Flavour	7.1	7.9	8.1
	Texture	6.6	7.5	7.9
	Overall acceptability	6.70	7.52	7.92

Sensory evaluation was performed on 9 point scale by hedonic rating method (Raganna, 2001). Score awarded by the panelist to the individual sensory characteristics namely, colour, taste, flavour, texture and overall acceptability are presented in Table 1 and 2 for tray drying and microwave power drying condition, respectively. Bar charts for sensory characteristics of fresh pretreated cauliflower slices at different temperature in tray drying condition are shown in Fig. 1 to 3 and in microwave power level condition at different power level are shown in Fig. 4 to 6.

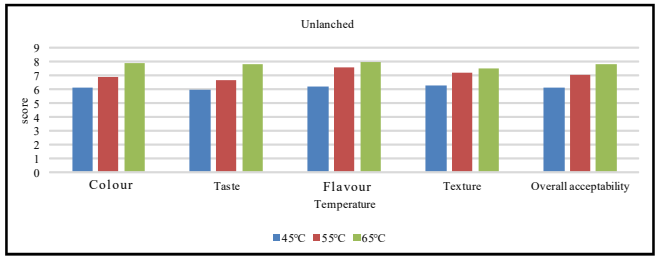

Fig. 1: Effect on sensory quality at different temperature in unblanched condition

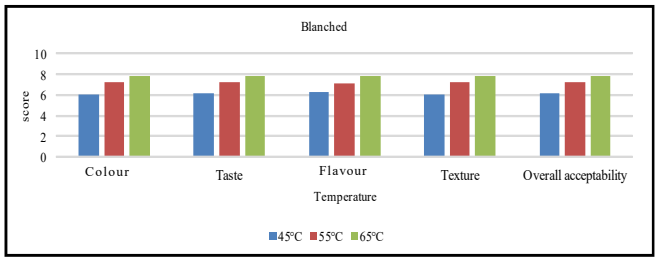

Fig. 2: Effect on sensory quality at different temperature in blanched condition

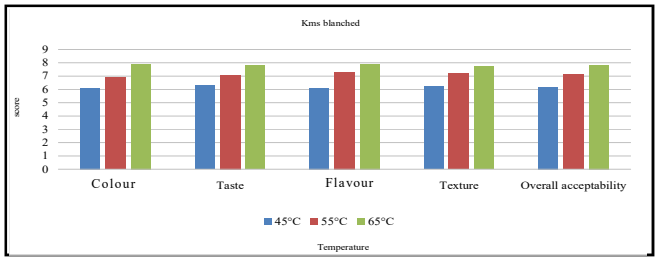

Fig. 3: Effect on sensory quality at different temperature in KMS blanched condition

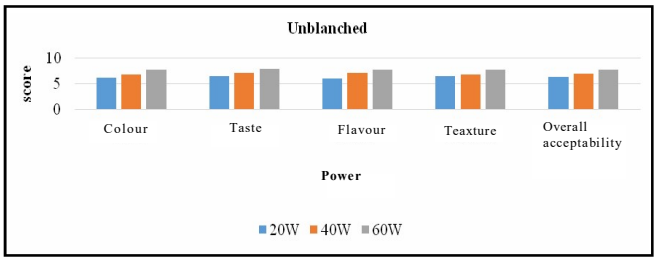

Fig. 4: Effect on sensory quality at different power level in Unblanched condition

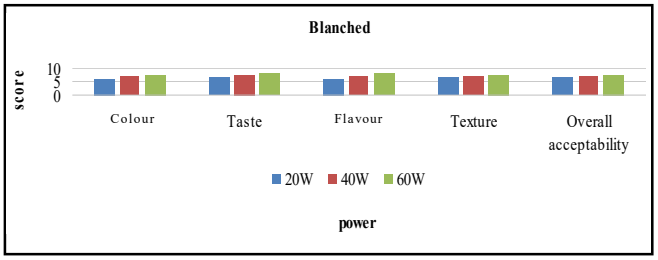

Fig. 5: Effect on sensory quality at different power level in blanched condition

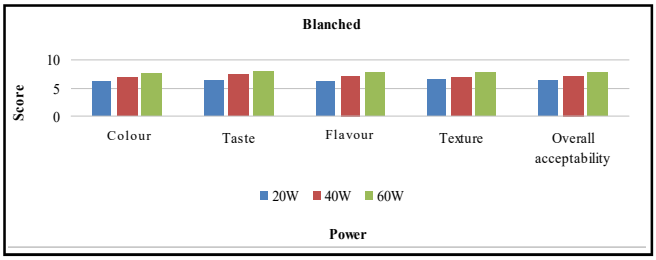

Fig. 6: Effect on sensory quality at different power level in KMS blanched condition

Conclusion:

Studies of sensory attributes of cauliflower slices were conducted at different pre-treatment and drying condition. Pre-treatments of cauliflower slices was unblanched, blanched and blanched with KMS and drying condition were 45, 55 and 65°C in tray dryer and 20W, 40W and 60W in microwave power dryer. Sensory attributes (colour, taste, flavour, texture and overall acceptability) were evaluated of dehydrated cauliflower slices. The highest value of taste (7.9) of colour was scored in kms blanched samples at 65°C in tray drying whereas in microwave dryer, it scored (7.9) at 60W power level. Sensory characteristics score was increase with increased of temperature and power level in all pretreatment of cauliflower slices in tray drying and microwave drying condition. The highest value of (7.9) was scored in blanched condition at 65°C in tray dryer where as it scored (7.9) at 60W power level in microwave dryer under unblanched condition. The maximum score of flavour (8.0) was observed at 65°C in unblanched condition in tray dryer whereas, it scored (8.1) at 60W in kms blanched condition in microwave dryer. The score of texture was obtained maximum (7.9) at 65°C in blanched condition in tray dryer whereas it scored same value at 60W in kms blanched condition in microwave

dryer. Overall acceptability score was highest (7.92) for microwave drying cauliflower slices at 60W power level than tray drying (7.85) at 65°C in kms blanched samples. Microwave power drying was found most suitable than tray drying for kms blanched cauliflower slices.

LITERATURE CITED

Ahmad, S., Varshney, A.K. and Srivastava, P.K. (2005). Quality attributes of fruit bar made from papaya and tomato by incorporating hydrocolloids. *Internat. J. Food Properties,* **8** (1) : 89-99.

Ali, A. J., Singh, A., Zecsha, M. and Khan, T. (2020). Studies on effect of storage conditions on quality attributes of cauliflower slices. Published B.tech. Thesis, Sam Higginbottom University of Agriculture , Technology and Science , Prayagraj (U.P.) India.

Attiyate, Y. (1979). Microwave vacuum drying: First industrial application, *J. Food Engg.*, **51**(2):78-79.

Chua, K.J., Mujumdar, A.S., Hawlader, M.N.A., Chou, S.K. and Ho, J.C. (2001). Batchdrying of banana pieces- effect of stepwise change in drying air temperature on dryingkinetics and product colour. *Food Research Int* ., **34** : 721-731.

Decareau, R.V. and Peterson, R.A. (1986). *Microwave processing and engineering*. Ellis Harwood Series in Food Science and Technology. FL. 224.

Kalse, S.B., Patil, M.M. and Jain, S.K. (2012). Microwave drying of onion slices. *Research J. Chemical Sciences*, **2** (4) : 57-60.

Lipinski, B ., Hanson, C., Lomax , J., Kitinoja, L., Waite, R. and Searchinger, T. (2013). *Reducing food loss and waste, working pape*r, Installment 2 of creating a sustainable food future. Washington, D.C., U.S.A.

Lund, D.B., Bruline, S. and Larer, M.E. (1972). Internal temperature distribution during individual quick blanching. *J. Food Sci.,* **37** : 167-170.

Mahn, A. and Reyes, A. (2012). An overview of health-promoting compounds of broccoli (*Brassica oleracea* var. italica) and the effect of processing. *Food Science & Technology International*, **18**(6) : 503-514.

Mudgal, V.D. and Panday, V.K. (2007). Dehydration charactersitics of cauliflower. *J. Food Engg.,***3**(6): 1556-3758.

Mudgal, V.D. and Pandey, V.K. (2008). Effect of pre-treatment on dehydration of cauliflower. *J. Food Science & Technology,* **45**(5) : 426-429.

National Horticultural Board (2018). *Indian Horticulture Database, Govt. of india,* Gurugram (Haryana), India.

Radhakrishnan, K.L. (1999). Editional. *India Food Packer*, **53** (3) : 4-5.

Rahman, M.S. (2007). Food preservation overview. In: *Hand book of food preservation*" (M. Shafiur Rahman, eds), pp. 3-5. CRC Press.

Ranganna, S. (1994). *Handbook of analysis and quality control of fruit and vegetable product*. Published by Tata McGraw-Hill Publishing Co. Ltd, New Delhi, India.

Ranganna, S. (2001). *Handbook of analysis and qulity control of fruit and vagetable products.* Published by Tata McGravo Hill Published Company Limitted, New Delhi, India.

Saini, S.P.S. and Singh, S. (1994). Juice composition of some new tomato hybrids. *J. F d.Sci. Technol.,* **31**: 3.

Sharma, J. S., Chatterju, S. , Gupta, S., K., Vivekan, K., Variyar, P.S. and Sharma, A. (2009). Development of shelfstable radiation processed ready -to-cook (RTC) Indian. vegetables. *Peaceful Uses of Atomic Energy*., 528-529.

Sinha, J. , Gupta, Ena, Tripathi, P. and Chandra, R. (2013). Microbial and sensory stability of cauliflower for 180 days preserved through hurdle technology. *J. Food Process. Technol.*, **4** : 9.

Sutar, P.P. and Prasad, S. (2008). Microwave drying technology-recent developments and R and D needs in India. In proceedings of 42nd ISAE Annual Convention, 13 Feb.2008.

Verma, V.K. and Kumar, D. (2019). Evaluation of physico-chemical characteristics of cauliflower slices at different pre-treatment and drying condition, *IJAE,* **12**(2): 243-250.

■ WEBLIOGRAPHY

US Department of Agricultural National Nutrient Database (2012). Agricultural Research Service, Nutrient Data Labortiory, USDA National Nutrient Database for Danderd reference, Release 25. *http://www.ars.vida. gov/ba/bhnrc/ndl.*

Received : *18.07.2020;* **Revised :** *26.08.2020;* **Accepted :** *27.09.2020*