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Original Research Article

Studies on Organoleptic Properties of Papad Prepared from Different Cultivar of Pearl Millet

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A B S T R A C T

The present investigation on "Studies on Organoleptic properties of papad prepared from different cultivar of pearl millet" was undertaken with the objective to study sensory properties of pearl millet papad and to identify the superior genotype of pearl millet for papad preparation. The experiment were carried out in Factorial Randomized Design, 11 treatments, 3 replications and two packaging material up to 90 days storage study. After primary sensory evaluation treatment T_8 (80 % pearl millet flour with 20 % rice flour) of *Dhanshakti* variety, T_5 (50 % pearl millet flour with 50 % rice flour) of variety *Phule Mahashakti* and *Phule Aadishakti* were selected. Among this three selected treatments papad prepared from *Dhanshakti* variety shows best results. The papad prepared from pearl millet and rice flour remained good in condition in the both packaging materials viz; LDPE and PP during 3 month of storage. But papad stored in LDPE showed good quality as compared to PP. The overall acceptability score of papad prepared from *Dhanshakti* variety decreased from 8.85 (at 30 days) to 7.77 (at 90 days) in LDPE and from 8.83 (at 30 days) to 8.73 (at 90 days) in PP. The standard plate count for papad obtained was 0 CFU/ml during 90 days of storage. As it has less moisture there is no growth of any micro organism. The cost of production of 1 kg of selected pearl millet papad prepared from *Dhanshakti* variety i.e. T_8 was about Rs 216 / kg and for *Phule Aadishakti* and *Phule Mahashakti* it was Rs 183 / kg.

Keywords

Pearl millet, Sensory evaluation, Pearl millet papad, Organoleptic properties

Introduction

Pearl millet is consumed in the form of leavened and unleavened breads, porridges, boiled or steamed food and beverages. Various types of traditional health food can be prepared from pearl millet such as *bhakar, Roti, Bundi laddu, Burti, Chakli, Chiwada Dive, Kharibundi, Khichadi, Masala papad, Thalipeeth and Vade.* Pearl millet has been recommended for several therapeutic purposes, as it has been found to inhibit tumor development (Huang and Ferraro, 1982), control blood pressure and plasma low-density lipoprotein cholesterol levels (Asp NG., 1996) and possesses anti-allergenic characteristics.

Due to its high fibre content, pearl millet is also recommended for the treatment of severe constipation, stomach ulcers, and weight loss. The major categories of traditional foods where pearl millet can be effectively used like fermented and unfermented flatbreads, fermented and unfermented thin and thick porridges, steamed and boiled products,

snack foods, alcoholic and non-alcoholic beverages. Cakes, cookies, pasta, a parboiled rice-like product and snack foods have been successfully produced (Schober *et al.*, 2005). Pearl millet is nutritionally superior to major cereals with respect to energy value, proteins, fat and minerals. It provides more energy than wheat, as the oil content, at 4.2 per cent, is higher (Klopfenstein and Hoseney, 1995, Mc Donough *et al.*, 2000; Malik *et al.*, 2002; Sehgal and Kawatra, 2006).

Materials and Methods

The experiment was conducted in the laboratory of Department of Food Science and Technology, Post Graduate Institute at Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 2019-2020.

Packaging Materials

The packaging materials like polypropylene (PP) and low density polyethylene (LDPE) were purchased from the local market.

Ingredients

The grains of three pearl millet varieties viz., *Dhanshakti*, *Phule Mahashakti* and *Phule Aadishakti* were purchased from All India Coordinated Research Project on Pearl millet, Dhule. Local variety of rice and other ingredients were purchased from local market of Rahuri.

Treatment Details

Based on preliminary trials, the experimental work plan was prepared with details of the treatment as given in table no. 2

Procedure for pearl millet papad preparation

The procedure for preparation of pearl millet papad is shown in fig. 1.

Organoleptic evaluation of papad

Organoleptic evaluation of papad for colour and appearance, flavour, texture, taste and overall acceptability was carried out by using standard method. For this semi trained judges were used and 1 to 9 point hedonic scale was used for rating the quality of the pearl millet papad. The mean of 10 judges was considered for evaluating the quality.

Packaging and storage of cookies

All selected treatments were packed in polypropylene (PP) and low density polyethylene (LDPE) and stored for 90 days. The samples were drawn at an interval of 30 days and evaluated for chemical quality.

Statistical analysis

All experiments were carried out by using Factorial Completely Randomized Design (FCRD). The data obtained in the present investigation were analyzed for the statistical significance according to the procedure given by Rangaswamy (2010).

Results and Discussion

Sensory evaluation of papad prepared from different cultivar of pearl millet with different combination of rice flour

The results of organoleptic evaluation of papad prepared from different cultivar of pearl millets with the combination of rice flour are presented in Table 3, 4 and 5. The papad were prepared and presented to panel of ten judges for assessing the quality and acceptability of product. Organoleptic evaluation of papad prepared from *Dhanshakti*, *Phule Aadishakti* and *Phule Mahashakti* variety were carried out using a 9 point hedonic scale of sensory characteristics such as colour, flavor, texture, taste and overall acceptability. Treatment T_8 i.e. 80 per

cent Pearl millet flour and 20per cent rice flour was selected for *Dhanshakti* variety, Treatment T_5 is selected for both *Phule Aadishakti* and *Phule Mahashakti* variety and all selected samples kept for 3 months storage study. Sensory evaluation was done at interval of 30 days. Organoleptic quality parameters of a product assume pivotal role in anticipating the consumer response to the product

Sensory evaluation of selected treatments of pearl millet papad

After sensory evaluation of three varieties i.e. *Dhanshakti*, *Phule Mahashakti*, *Phule Aadishakti* out of 10 treatments of each variety one treatment is selected. From 10 treatments of *Dhanshakti* papad T_8 treatment (80% pearl millet flour + 20% rice flour) was selected by judges. Combination of 50 % pearl millet flour and 50 % rice flour i.e. T_5 is selected for both *Phule Mahashakti* and *Phule Aadishakti*. Papad prepared from 100% rice flour treated as control (standard) while judging the quality of pearl millet papad. Statistical result showed that there was significant difference in all sensory quality of papad for all selected treatments.

Overall acceptability is the total reflection of the scores obtained for color, texture flavor and taste of the papad. The overall acceptability score ranged between 8.20 and 8.80 with mean 8.44. The overall acceptability scores were highest for papad prepared from *Dhanshakti* variety (8.44) followed by *Phule Mahashakti* (8.33) and *Phule Aadishakti*.

The papad prepared from rice, *Dhanshakti, Phule Mahashakti and Phule Aadishakti* were packed in LDPE and PP stored in ambient temperature. Papad were analyzed for overall acceptability during storage study showed in Table no. 7. Score for rice papad (T_0) packed in LDPE start to decrease up to 90 days. It was from 8.90 to 8.78. While papad packed in PP shows decreasement from 8.86 up to 8.79. Papad prepared from *Dhanshakti* variety (T_1) packed in LDPE were analyzed at 30 days and showed 8.85 score and at 90 days it was 8.79. The result changes when packaging material was changed i.e. in PP.

It means for *Dhanshakti* variety (T_1) LDPE shows best results. Score for overall acceptability in *Phule Mahashakti* papad (T_2) packed in LDPE ranges from 8.58 to 8.25 and for PP it changed from 8.50 to 8.18.The last variety i.e.*Phule Aadishakti* (T_3) used for papad preparation packed in LDPE at 30 days storage study, score for overall acceptability was 8.48 and at 90 days it decreases up to 8.14, while in other packaging material i.e. in PP it varies from 7.35 to 6.87 out of 9.

Table.1 Ingredients required for pearl millet papad preparation

Sr.No.	Ingredients	Quantity
1.	Pearl millet and rice flour mixture	1 kg
2.	Salt	32g
3.	*Papad khar*	10g
4.	Black pepper	1.200g
5.	Sesame seed	20g
6.	Asafoitida	0.50 g
7.	Water (as per requirement)	1000ml

Table.2 Treatments for preparation of papad with combinations of rice flour

Treatments	Pearl millet flour (%)	Rice flour (%)
T_0	00	100
T_1	10	90
T_2	20	80
T_3	30	70
T_4	40	60
T_5	50	50
T_6	60	40
T_7	70	30
T_8	80	20
T_9	90	10
T_{10}	100	00

Table.3 Sensory evaluation of papad prepared from *Dhanshakti* variety of pearl millet with different combination of rice flour.

Treatment	Colour and appearance	Texture (Crispiness)	Flavor	Taste	Overall acceptability
T_0	8.30	8.18	8.40	8.30	8.29
T_1	7.03	7.30	7.80	7.50	7.40
T_2	6.50	6.85	6.30	6.43	6.52
T_3	6.90	7.00	7.50	6.50	6.97
T_4	7.40	6.50	6.50	7.30	6.92
T_5	8.02	8.00	7.50	8.00	7.88
T_6	8.15	7.00	7.80	8.10	7.76
T_7	7.03	7.50	7.80	7.30	7.40
T_8	8.30	8.15	8.35	8.20	8.25
T_9	6.06	7.20	6.00	6.00	6.31
T_{10}	5.03	6.30	5.80	5.45	5.64
Mean	7.07	7.27	7.25	7.18	7.21
C.D.	0.101	0.037	0.581	0.035	0.585
S.E(m)	0.034	0.012	0.198	0.012	0.198
S.E(d)	0.048	0.018	0.281	0.017	0.280
C:V	0.827	0.296	4.700	0.284	4.722

*All results are mean values of ten replications
*Maximum score out of 9 point hedonic scale
Where,
T_0: Papad prepared from100% Rice flour, T_1: Papad prepared from 10% pearl millet flour and 90% rice flour,
T_2:Papad prepared from 20% pearl millet flour and 80% rice flour, T_3:Papad prepared from 30% pearl millet flour and 70% rice flour,
T_4:Papad prepared from 40% pearl millet flour and 60% rice flour, T_5:Papad prepared from 50% pearl millet flour and 50% rice flour,
T_6:Papad prepared from 60% pearl millet flour and 40% rice flour, T_7:Papad prepared from 70% pearl millet flour and 30% rice flour,
T_8:Papad prepared from 80% pearl millet flour and 20% rice flour, T_9: Papad prepared from 90% pearl millet flour and 10% rice flour,
T_{10}:Papad prepared from 100% pearl millet flour.

Table.4 Sensory evaluation of papad prepared from *PhuleMahashakti* variety of pearl millet with different combination of rice flour.

Treatments	Colour and appearance	Texture (Crispiness)	Flavor	Taste	Overall acceptability
T_0	8.49	7.90	7.76	8.30	8.11
T_1	8.30	6.46	7.32	7.90	7.49
T_2	8.51	6.80	7.30	7.59	7.55
T_3	8.42	6.82	7.28	8.09	7.65
T_4	8.40	7.30	7.35	8.13	7.79
T_5	8.45	7.90	7.85	8.20	8.10
T_6	7.23	7.42	6.67	6.23	6.88
T_7	7.52	7.62	6.01	7.20	7.08
T_8	7.40	6.63	6.16	7.25	6.86
T_9	7.41	6.35	6.99	7.10	6.96
T_{10}	5.10	6.90	6.10	5.60	5.92
Mean	7.74	7.10	6.98	7.41	7.30
C.D	0.041	0.033	0.052	0.034	0.036
S.E(m)	0.014	0.011	0.018	0.012	0.012
S.E(d)	0.020	0.016	0.025	0.016	0.016
C:V	0.311	0.272	0.437	0.271	0.273

*All results are mean values of ten replications
*Maximum score out of 9 point hedonic scale

Table.5 Sensory evaluation of papad prepared from *Phule Aadishakti* variety of pearl millet prepared different combination of rice flour.

Treatment	Colour and appearance	Texture (Crispiness)	Flavour	Taste	Overall acceptability
T_0	8.25	8.10	8.30	8.28	8.23
T_1	8.19	8.10	7.79	8.18	8.06
T_2	8.14	7.90	7.77	8.12	7.98
T_3	8.12	8.10	7.98	7.20	7.85
T_4	7.17	7.28	8.25	8.16	7.71
T_5	8.15	7.90	8.20	8.38	8.15
T_6	6.90	6.70	6.74	6.25	6.64
T_7	5.90	6.28	6.89	6.24	6.32
T_8	6.12	6.05	6.19	6.28	6.16
T_9	6.25	5.56	6.20	5.28	5.82
T_{10}	5.24	5.30	5.00	6.10	5.41
Mean	7.13	7.02	7.21	7.13	7.12
C.D	0.036	0.035	0.033	0.036	0.036
S.E(m)	0.012	0.012	0.011	0.012	0.012
S.E(d)	0.017	0.017	0.016	0.016	0.017
C:V	0.288	0.291	0.272	0.281	0.289

*All results are mean values of ten replications
*Maximum score out of 9 point hedonic scale

Table.6 Organoleptic evaluation of selected treatments of pearl millet fried papad

Treatment	Colour and appearance	Texture (Crispiness)	Flavor	Taste	Overall acceptability
T_0	8.86	8.50	8.90	8.90	8.79
T_1	8.80	7.96	8.50	8.50	8.44
T_2	8.50	7.90	8.00	8.93	8.33
T_3	8.50	7.96	7.90	8.50	8.21
Mean	8.66	8.08	8.32	8.70	8.44
C: D	0.19	0.18	0.17	0.15	0.03
S.E(m)	0.06	0.06	0.05	0.05	0.01
S.E(d)	0.08	0.08	0.08	0.07	0.01
C:V	1.20	1.33	1.20	1.04	1.32

*Each value represents the average of three determinations
*Maximum score out of 9 point hedonic scale
T_0 : Control rice papad (100% rice flour),
T_1 : Papad prepared from Dhanshakti variety(80% pearl millet flour :20% rice flour),
T_2 : Papad prepared from Phule Mahashakti (50% pearl millet flour :50% rice flour),
T_3 : Papad prepared from Phule Aadishakti (50 pearl millet flour :50% rice flour).

Fig.1 Flow chart for preparation of peal millet papad

Cleaning of pearl millet seed and rice
↓
Grinding
↓
Sieving(60 mesh)
↓
Add ingredients
(*Papadkhar* , Rice flour, Salt, Sesame seed,
asafetida, Black pepper)
↓
Mixing flour in boiling water, stir well.
↓
Mixing into smooth dough.
↓
Divide dough into small portions 10 to 12 g each ball
↓
Steam the ball in pressure cooker,
(15 psi for 15 minutes)
↓
Cooling at room temperature
↓
Place these balls in plastic sheets.
↓
Place these balls in the papad press machine.
↓
Press into 0.10 or 0.15 cm thick sheet.
↓
Dry at room temperature
↓
packaging
↓
Storage

Table.7 Effect of packaging material and storage period on organoleptic properties of pearl millet papad during storage

Parameter	Colour and appearance	Texture	Flavor	Taste	Overall acceptability
Treatment					
T_0	8.85	8.86	8.81	8.83	8.83
T_1	8.82	8.82	8.77	8.79	8.79
T_2	8.34	8.38	8.38	8.42	8.37
T_3	7.75	7.69	7.65	7.56	7.72
S.E. $\pm$	0.005	0.005	0.006	0.006	0.028
CD at 5 %	0.015	0.013	0.016	0.017	0.078
Packaging material					
P_0	8.57	8.56	8.54	8.55	8.58
P_1	8.30	8.31	8.27	8.24	8.28
S.E. $\pm$	0.004	0.003	0.004	0.004	0.019
CD at 5 %	0.010	0.009	0.011	0.012	0.055
Storage period					
C_1	8.53	8.54	8.54	8.56	8.54
C_2	8.47	8.46	8.41	8.41	8.43
C_3	8.32	8.32	8.26	8.22	8.31
S.E. $\pm$	0.005	0.004	0.005	0.005	0.024
CD at 5 %	0.013	0.012	0.014	0.014	0.068
Interaction					
$T_0P_0C_1$	8.90	8.90	8.90	8.90	8.90
$T_0P_0C_2$	8.85	8.88	8.81	8.83	8.84
$T_0P_0C_3$	8.83	8.85	8.78	8.81	8.78
$T_0P_1C_1$	8.88	8.85	8.87	8.86	8.86
$T_0P_1C_2$	8.83	8.84	8.80	8.80	8.82
$T_0P_1C_3$	8.81	8.83	8.75	8.78	8.79
$T_1P_0C_1$	8.85	8.87	8.85	8.84	8.85
$T_1P_0C_2$	8.83	8.85	8.76	8.81	8.81
$T_1P_0C_3$	8.81	8.83	8.75	8.78	8.79
$T_1P_1C_1$	8.83	8.81	8.83	8.80	8.83
$T_1P_1C_2$	8.81	8.78	8.75	8.77	8.78
$T_1P_1C_3$	8.76	8.75	8.73	8.70	8.73
$T_2P_0C_1$	8.50	8.57	8.57	8.70	8.58
$T_2P_0C_2$	8.40	8.41	8.38	8.35	8.38
$T_2P_0C_3$	8.35	8.30	8.28	8.10	8.25
$T_2P_1C_1$	8.41	8.51	8.50	8.61	8.50
$T_2P_1C_2$	8.30	8.38	8.35	8.45	8.37
$T_2P_1C_3$	8.12	8.10	8.20	8.31	8.18
$T_3P_0C_1$	8.40	8.41	8.51	8.60	8.48
$T_3P_0C_2$	8.30	8.15	8.18	8.10	8.18

$T_3P_0C_3$	7.90	7.80	7.70	7.85	8.14
$T_3P_1C_1$	7.50	7.40	7.35	7.15	7.35
$T_3P_1C_2$	7.40	7.30	7.30	7.08	7.31
$T_3P_1C_3$	7.00	7.10	6.90	6.50	6.87
S.E. ±	0.013	0.012	0.014	0.014	0.067
CD at 5 %	0.036	0.033	0.038	0.041	0.201

*All results are the mean of ten replications
* The organoleptic score is based on 9 point hedonic scale.
Where,
T_0 : Control (Standard) rice papad (100% rice flour)
T_1 : Papad prepared from *Dhanshakti* variety of pearl millet(80% pearl millet flour : 20% rice flour)
T_2 : Papad prepared from *PhuleMahashakti* variety(50% pearl millet flour : 50% rice flour)
T_3 : Papad prepared from *PhuleAadishakti* variety(50% pearl millet flour : 50% rice flour)
P_0 : LDPE packaging material
P_1 : PPpackaging material
C_1 : Storage study at 30 days,
C_2 : Storage study at 60 days,
C_3 : Storage study at 90 days.

The result itself showed that in LDPE packaging material was best for long durational preservation of papad.The statistical result showed that the packaging material LDPE and PP had significant effect. The interaction between treatment and packaging material and storage period was also significant. There is decreasement in score for overall acceptability during storage of papad in LDPE and PP packaging material.The results are accordance with the literature of International journal of current research published by Naazni, P and Pradheepa, S (2010).

In conclusion, the result showed that the papad prepared from *Dhanshakti* variety i.e.T_8 (80% pearl millet flour and 20 % rice flour) had better results as compared to prepared from *Phule Mahashakti* and *Phule Aadishakti* variety. It is evident from all organoleptic properties. Papad prepared with 80 percent pearl millet flour of *Dhanshakti* variety and 20 percent rice flour is the best in all aspects as compare to other therefore, from the present investigation it is concluded that the variety *Dhanshakti* released by MPKV, Rahuri is best suited for the papad snack product preparation.

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