

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

Sensory Attributes of Rice Based Extrusion Cooked Food Product of Lentil and Oats

Swati Cyril^{1*}, A. K. Gupta^{**}, Priti Jain and Sheela Pandey^{**}

M.Tech Student, College of Agricultural Engineering, JNKVV, Jabalpur, India*

Assistant Professor, Department of Post Harvest Process & Food Engineering, College of Agricultural Engineering,
JNKVV, Jabalpur, India**

ABSTRACT: Extruded food product of rice, lentil and oat was prepared using 70% rice flour and lentil and oat flours ranging from 5 to 25%. The feed moisture content was kept in the range of 8 to 16 % (w.b.). The bends were extruded in a single screw extruder at selected combinations of barrel temperature varying from 130-170°C, die head temperature (180-220°C) and screw speed (60-100 rpm). The prepared extrudates were evaluated by a sensory panel for the various sensory attributes using 9 point Hedonic scale. Colour of extrudates prepared with rice, lentil and oat in 70:15:15 with 12% moisture content and extrudate at screw speed at 60 rpm, 150°C barrel temperature, 200°C die head temperature was liked very much by the sensory panel by awarding the sensory score of 8.0 on 9 point hedonic scale. Taste of extrudates prepared with rice, lentil and oat in 70:10:20 with 10% moisture content and extrudate at screw speed at 90 rpm, 160°C barrel temperature, 190°C die head temperature was liked very much by the sensory panel by awarding the sensory score of 7.3 on 9 point hedonic scale. Texture, flavor and overall acceptability of extrudates prepared with rice, lentil and oat in 70:20:10 with 10% moisture content and extrudate at screw speed at 90 rpm, 140°C barrel temperature, 190°C die head temperature was liked very much by the sensory panel by awarding the sensory score of 7.6, 7.3 and 7.15 respectively on 9 point hedonic scale.

I. INTRODUCTION

Extrusion cooking can be defined as a cooking process consisting of forcing the food material through a specially designed opening after prior treatment (White, 1994). It aims to produce a voluminous, expanded and crispy product. In principle there is no limitation for type of raw materials which can be used for extrusion. It is popular because of reduced processing cost, higher production rate, versatility to produce wide variety of products and effluent free operation. Extrusion cooking has the potential to become one of the most promising frontier technologies suitable to prepare good quality engineered food products.

An extruder cooker combines several unit operations such as –mixing, cooking, kneading, shearing, cooling and forming. Various combinations of operation are possible because of a multitude of controllable variable such as feed rate, total moisture in barrel, screw speed, barrel temperature, screw profile and die configuration (Linko et al, 1981 and Wiedman & Strobel, 1987). The energy input comes mainly from the conversion of mechanical energy into thermal energy. Extrusion cooking is an HTST process where starches are gelatinized, proteins are denatured and extrudates are texturally and histological restructured. HTST extrusion is a thermal process which reduces the microbial contamination and eliminates undesirable flavors (Frame, 1994).

II. MATERIAL AND METHODS

Rice, lentil and oat grains were procured from the local market for the present study. A study was conducted to evaluate the moisture content of feed and blend ratio and operational parameters (barrel temperature, screw speed and die head temperature) on the sensory attributes of the rice based extrusion cooked food product of lentil and oat.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

For the product development screw speed was kept at 20 rpm, barrel temperature of zone 1 and 2 was 40⁰C and 60⁰C respectively. Length to diameter ratio of extruder was 20:1, compression ratio was 2:1 and diameter of die was 5 mm.

III. PREPARATION OF THE SAMPLES

Grains of rice, lentil and oat were procured from local market and flour was obtained by grinding them in a hammer mill. Samples of different compositions were prepared by mixing the calculated amount of flours. Samples of various proportions of the rice, lentil and oat flours of desired moisture content (8, 10, 12, 14 and 16% wb) were prepared by adding or removing the calculated amount of water. Tempering of samples was done by keeping them in aluminum foil packets for 24 hrs at room temperature to get uniform moisture throughout the blends.

Hammer mill was used to make the flour of the selected grains, while Brabender single screw laboratory model extruder (D47055 DUISBURG) was used for the preparation of the extrudates.

IV. EVALUATION OF THE SENSORY PARAMETERS

Sensory evaluation of the samples was done on the basis of 9-Point Hedonic scale for different sensory attributes such as colour, aroma, taste, flavor, texture and overall acceptability (Ranganna, 1986). Sensory panel consisted of 10 members. Faculty members, students and staff members of College of Agriculture Engineering, Jabalpur evaluated the prepared rice based extruded product of lentil and oat on 9 point hedonic scale. Sensory score sheet was provided to each of them for recording their scores. The samples were placed before the panel members for their evaluation on 9 point hedonic scale.

Table1: 9 point Hedonic scale

Sensory Score	Particular	Sensory Score	Particular
9	Liked extremely	4	Dislike slightly
8	Liked very much	3	Dislike moderately
7	Like moderately	2	Dislike very much
6	Liked slightly	1	Dislike extremely
5	Neither liked nor disliked		

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

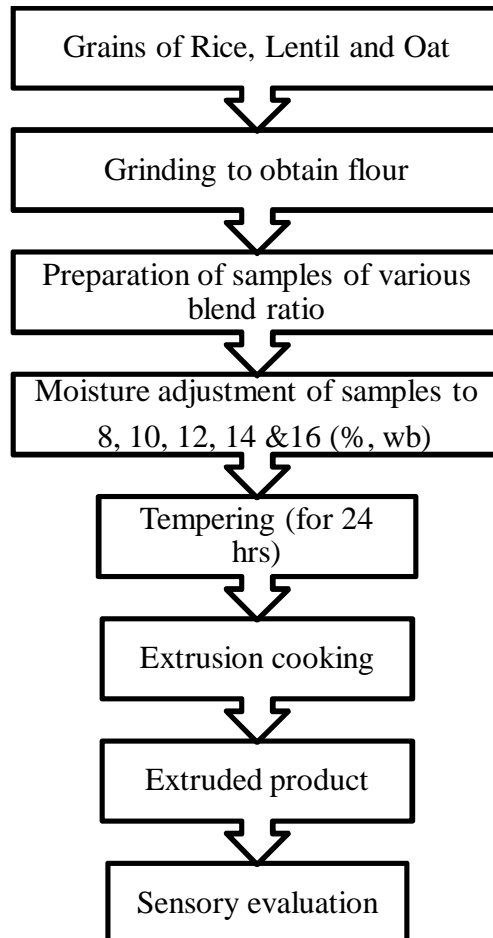


Fig.1 Flow chart for the preparation of rice based extrusion cooked food product of lentil and Oat



Plate 1: Rice based extrudates of lentil and oat

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

V. RESULTS AND DISCUSSION

32 samples of rice based extrusion cooked food product prepared with 5 selected proportions of rice, lentil and oat and processed under selected operating conditions were evaluated by a 10 member's sensory panel constituted for the purpose. The average sensory scores awarded by the panel for different sensory attributes of rice based extrusion cooked food product of lentil and oat are presented in Table 2.

Colour

Colour of extrudates prepared with rice, lentil and oat in 70:15:15 with 12% moisture content and extrudate at screw speed at 60 rpm, 150⁰C barrel temperature, 200⁰C die head temperature was liked very much by the sensory panel by awarding the sensory score of 8.0 on 9 point hedonic scale. However, for the samples having rice, lentil and oat in 70:15:15 with 12% moisture content with a change in die head temperature from 200-220⁰C and screw speed from 60-80 rpm the sensory scores for colour reduces to 7.3. The samples prepared with rice, lentil, and oat 70:15:15 with 12% feed moisture content and extruded at screw speed 80 rpm, 150⁰C barrel temperature and die head temperature 200⁰C was slightly dislike by the sensory panel with a sensory scores of 4.1.

Texture

Texture of extrudates prepared with rice, lentil and oat in 70:20:10 with 10% moisture content and extrudate at screw speed at 90 rpm, 140⁰C barrel temperature, 190⁰C die head temperature was liked very much by the sensory panel by awarding the sensory score of 7.6 on 9 point hedonic scale. However, for the samples having rice, lentil and oat in 70:10:20 with 10% moisture content die head temperature from 190⁰C, 140⁰C barrel temperature with a change in and screw speed from 90-70 rpm the sensory scores for texture reduces to 7.4. The samples prepared with rice, lentil, and oat 70:15:15 with 12% feed moisture content and extruded at screw speed 80 rpm, 150⁰C barrel temperature and 200⁰C die head temperature was slightly dislike by the sensory panel with a sensory scores of 4.2.

Flavor

Flavor of extrudates prepared with rice, lentil and oat in 70:20:10 with 10% moisture content and extrudate at screw speed at 90 rpm, 140⁰C barrel temperature, 190⁰C die head temperature and 14% moisture content and extrudate at screw speed at 70 rpm, 160⁰C barrel temperature, 190⁰C die head temperature was liked very much by the sensory panel by awarding the sensory score of 7.3 on 9 point hedonic scale. The samples prepared with rice, lentil, and oat 70:15:15 with 12% feed moisture content and extruded at screw speed 80 rpm, 150⁰C barrel temperature and 200⁰C die head temperature was slightly dislike by the sensory panel with a sensory scores of 4.2.

Taste

Taste of extrudates prepared with rice, lentil and oat in 70:10:20 with 10% moisture content and extrudate at screw speed at 90 rpm, 160⁰C barrel temperature, 190⁰C die head temperature was liked very much by the sensory panel by awarding the sensory score of 7.3 on 9 point hedonic scale. However, for the samples having rice, lentil and oat in 70:20:10 with 10% moisture content, screw speed 90 rpm, die head temperature 190⁰C with a change in the barrel temperature from 160 to 140⁰C sensory scores for taste is reduces to 7.1. The samples prepared with rice, lentil, and oat 70:15:15 with 12% feed moisture content and extruded at screw speed 80 rpm, 150⁰C barrel temperature and 200⁰C die head temperature was slightly dislike by the sensory panel with a sensory scores of 4.3.

Overall acceptability

The extrudates having rice lentil and oat in 70:20:10 ratio with 10% moisture content and extruded at barrel temperature 140⁰C, die head temperature 190⁰C, screw speed 90 rpm received the highest score (7.15) for the overall acceptability followed by the product with at 10% moisture content and rice: lentil: oat in 70:10:20 ratio and extruded at barrel temperature 160⁰C, die head temperature 190⁰C, screw speed 90 rpm.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

Table 2: Sensory score of the rice based extruded food product of lentil and oats

Run No.	Blend ratio	Sensory attributes					
		Colour	Texture	Flavour	Taste	Aroma	Overall acceptability
1	70:20:10	6.5	6.1	6.2	6.2	6.8	6.36
2	70:10:20	6.5	6.9	7.3	4.8	6.0	6.30
3	70:15:15	8.0	5.0	4.8	5.1	5.3	5.64
4	70:10:20	5.5	5.0	4.7	5.0	4.9	5.02
5	70:15:15	6.7	6.3	6.5	6.6	6.2	6.46
6	70:15:15	6.2	6.2	6.5	6.1	5.8	6.16
7	70:5:25	4.2	4.7	4.3	4.5	4.4	4.42
8	70:10:20	6.4	7.4	6.7	7.0	6.4	6.78
9	70:15:15	7.3	6.9	6.5	6.8	6.0	6.70
10	70:20:10	6.3	6.1	5.5	5.3	5.0	5.64
11	70:15:15	6.2	7.0	6.5	6.5	6.1	6.46
12	70:10:20	6.6	6.1	6.5	6.3	5.9	6.28
13	70:20:10	6.4	6.9	5.7	6.1	5.9	6.2
14	70:15:15	5.9	6.5	6.7	6.8	6.3	6.44
15	70:15:15	6.8	6.8	6.3	6.5	6.0	6.48
16	70:20:10	6.6	7.6	7.3	7.1	6.6	7.04
17	70:10:20	6.6	7.1	6.5	6.6	6.2	6.6
18	70:20:10	6.7	6.8	6.4	6.6	6.0	6.5
19	70:15:15	5.2	5.1	6.1	5.1	4.6	5.2

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

20	70:10:2 0	4.8	6.5	6.1	5.7	7.3	6.08
21	70:20:1 0	4.8	4.5	5.2	4.9	4.6	4.8
22	70:15:1 5	5.5	6.4	5.7	6.1	5.9	5.92
23	70:20:1 0	5.7	4.9	5.1	4.7	4.5	4.98
24	70:25:5	6.3	6.1	6.2	5.9	5.8	6.06
25	70:20:1 0	5.8	6.3	6.4	6.0	5.7	6.04
26	70:15:1 5	5.9	5.8	6.2	6.3	5.7	5.98
27	70:15:1 5	7.0	5.9	6.3	6.3	5.8	6.26
28	70:10:2 0	6.7	7.2	6.9	7.3	7.4	7.1
29	70:15:1 5	6.7	6.5	5.4	6.1	5.6	6.06
30	70:10:2 0	5.2	4.9	4.8	4.3	4.5	4.74
31	70:15:1 5	4.1	4.2	4.2	4.3	4.2	4.2
32	70:15:1 5	5.8	5.2	5.3	5.4	5.2	5.38

VI. CONCLUSION

Maximum value of overall acceptability (7.15) was recorded for the product with 70% rice, 20% lentil and 10% oat in the blend and extruded at 190°C die head temperature, 140°C barrel temperature and screw speed of 90 rpm.

REFERENCES

1. Frame ND. 1994. The technology of Extrusion cooking. Blackie Academic and Professional Press, London. Chapman and Hall Inc., New York.
2. White G. 1994. Defining the true meaning of snacks. Food Technology International Europe 2, 115-117.
3. Wiedman W and Strobel E. 1987. Processing and economic advantages of extrusion cooking in comparison with conventional processing in the food industry. In C. O'Connor (ed.), Extrusion Technology for the Food Industry. Elsevier Applied science, New York, pp 132-169.
4. Linko P, Colonna P and Mercier C. 1981. High temperature, short time extrusion-cooking. Advances in Cereal Science and Technology 4:145-235.
5. Ranganna S. (Eds). 1986. A handbook of analysis and quality for fruit vegetable products. 21p.