RESEARCH ARTICLE

Evaluation of Functional Properties of Composite Flour

Sunil[1]*, Neelesh Chauhan[1], B.R. Singh[1], Suresh Chandra[1], Samsher[1], and R.S. Sengar[2]

[1]Department of Agricultural Engineering Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut U.P. India
[2]Department of Agriculture Biotechnology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut U.P. India

ABSTRACT

The present research was carried out to study the functional properties of composite flours, that is, wheat flour, pumpkin flour, and pumpkin seed flour. The flours were formulated by taking different proportions of composite flours in the ratio of (T100) 100:0:0, (T1) 90:7.5:2.5, (T2) 80:15:5, (T3) 70:20:10 and (T4) 60:25:15, respectively. The functional properties like swelling capacity, water absorption capacity, oil absorption capacity, foam capacity, foam stability, emulsion activity, emulsion stability and bulk density of composite flours were evaluated. The functional properties of composite flours were T4 has the highest applicable property.

Keywords: *Functional property, composite flours, wheat flour, pumpkin flour, pumpkin seed flour*

INTRODUCTION

In India, bakery products, especially cookies, are gaining wide popularity as processed foods in rural and urban areas among people of all age groups. Some of the reasons for such wide popularity of cookies varied best and acceptable returns profiles to suit the accessible market. Cookies are palatable and provide an excellent source of fat, carbohydrates, proteins, minerals, and some vitamins. Cookies could conveniently supplement protein in the diet of children who live in poverty areas. They could be prepared at a central location and distributed to school children. Cookies are considered better for supplementation due to their ready to-eat form, vast consumption, relatively long shelf life, and good eating quality [14].

Wheat is the second most important winter cereal in India after rice. Wheat is consumed in various forms by more than 1000 million human beings. It is used for multiple food purposes after grinding wheat kernel into flour. Wheat flour is the primary ingredient in chapatti, bread, and bakery products such as cake, cookies, crackers, doughnuts, sweet rolls, biscuits, etc.

Pumpkin can be processed into flour which has a longer shelf life. Pumpkin flour is used because of its highly desirable flavor, sweetness, and deep yellow color. It has been reported to be used to supplement cereal flour in bakery products [9]. Pumpkin flour is currently the main processed product from pumpkin fruit because it can be easily stored for a long time and conveniently used in the manufacturing of formulated foods. Pumpkin seeds, also known as pepitas which are tiny, flat, green, edible seeds. Pumpkin seeds are loaded with nutrients and medicinal properties, due to which these seeds are used for remedial purposes all over the world. Pumpkin seeds are often eaten as a snack after roasting and salting in Arab countries [1].

The functional properties of flours play an essential role in the manufacturing of products [2]. Functional properties are the fundamental physicochemical

OPEN ACCESS JOURNEL

Check for updates

Citation: Sunil, Neelesh Chauhan, B.R. Singh, Suresh Chandra, Samsher, and R.S. Sengar (2021). Evaluation of Functional Properties of Composite Flour. *Chemical Engineering.* v02i04, 73-76. http://dx.doi.org/10.53709/CHE.2021.v02i04.012

DOI:
http://dx.doi.org/10.53709/CHE.2021.v02i04.012

Corresponding Author:
Sunil
sunilchandelnduat6771@gmail.com

Received on: September 8, 2021
Revised on: October 18, 2021
Accepted on: November 19, 2021

properties that reflect the complex interaction between the composition, structure, molecular conformation, and physico-chemical properties of food components together with the nature of the environment in which these are associated and measured [8, 6, 12, 3]. The functionality of food is the properties of food ingredients other than a nutritional attribute which has a significant impact on its application. The functional characteristics determine the utilization and use of food material for various food products.

MATERIALS AND METHODS

The wheat flour, pumpkin flour and pumpkin seed flour were selected for composite flours. The functional properties of flours were analyzed, that is, swelling capacity, water absorption capacity, oil absorption capacity, foam capacity, foam stability, emulsion activity, emulsion stability, and bulk density.

Treatments

T_0=100% (Wheat flour)

T_1= 90: 7.5: 2.5 (Wheat flour: Pumpkin flour: Pumpkin seed flour)

T_2 =80: 15: 5 (Wheat flour: Pumpkin flour: Pumpkin seed flour)

T_3=70: 20: 10 (Wheat flour: Pumpkin flour: Pumpkin seed flour)

T_4= 60: 25: 15 (Wheat flour: Pumpkin flour: Pumpkin seed flour)

The swelling capacity (WC) was determined by the method described by [11].

The water absorption capacity (WAC) and oil absorption capacity (OAC) of the flours were determined by the method of [13].

The emulsion activity (EA) and emulsion stability (ES) by [15].

The foam capacity (FC) and foam stability (FS) were determined by [10].

The bulk density was calculated by [5].

RESULTS AND DISCUSSION

Different types of functional properties of composite flours were analyzed. The swelling capacity of blended flour ranged from 16.87 to 29.98 %. The value of swelling capacity was found in T_4 (29.98%) followed by T_3 (26.83%), T_2 (23.77%), T_1 (21.60%), and T_0 (16.87%), respectively. In the case of composite flour, the swelling capacity of flours increased with an increase in the incorporation ratio of pumpkin flour and pumpkin seed flour in wheat flour. Similar trends were found by [3] during the assessment of functional properties of different flours.

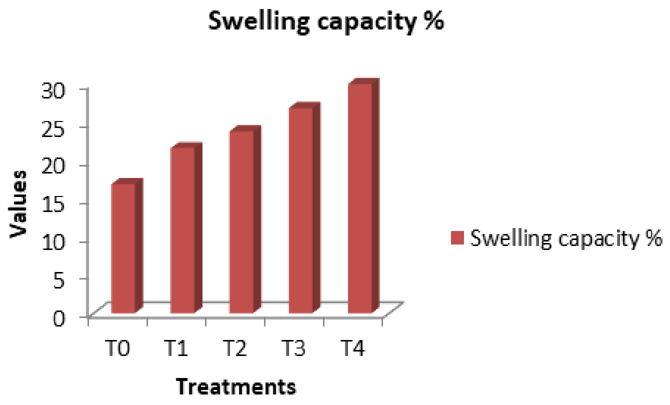

Fig.1: Swelling capacity (%) of composite flour

Water absorption capacity is helpful in determining the capacity of flour to take up water and swelling to improve uniformity in food. The water absorption capacity of composite flour ranged from 139.35 to 152.63%. The value of water absorption capacity was found in T_4 (152.63%) followed by T_3 (148.02%), T_2 (145.80%), T_1 (143.59%), and T_0 (139.35%), respectively.

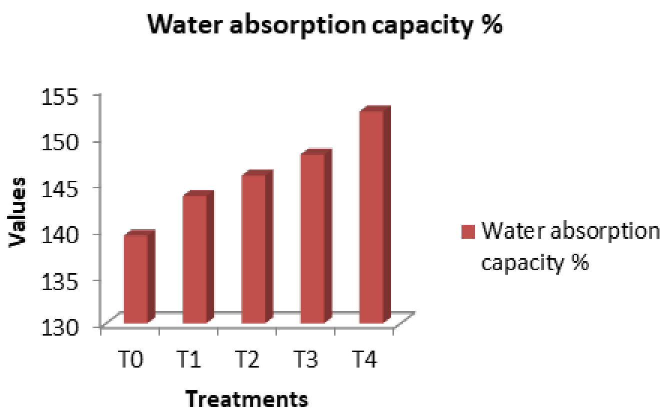

Fig.2: Water absorption capacity (%) of composite flour

The oil absorption capacity of composite flour ranged from 145.28 to 159.73%. The value of oil absorption capacity was found in T_4 (159.73%) followed by T_3 (156.10%), T_2 (152.22%), T_1 (149.64%), and T_0 (145.28%), respectively.

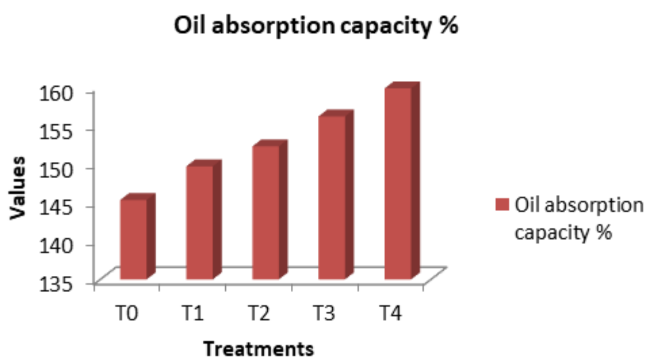

Fig.3: Oil absorption capacity (%) of composite flour

http://dx.doi.org/10.53709/CHE.2021.v02i04.012

The foam capacity of composite flour, ranged from 13.73 to 23.69%. The value of foam capacity was found in T_4 (23.69%) followed by T_3 (21.33%), T_2 (19.16%), T_1 (17.42%), and T_0 (13.73%), respectively. In the case of composite flour, the foam capacity of flours increased with an increase in the level of incorporation ratio of pumpkin flour and pumpkin seed flour in wheat flour.

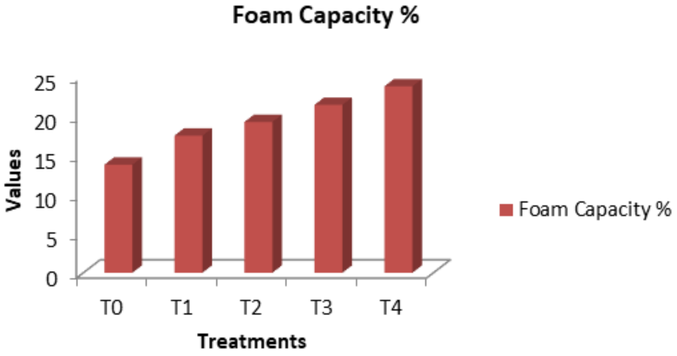

Fig.4: Foam capacity (%) of composite flour

Foam stability refers to the ability of the protein to stabilize against mechanical and gravitational stresses [4]. The foam stability of composite flour ranged from 1.97 to 2.74%. The value of foam stability was found in T_4 (2.74%) followed by T_3 (2.68%), T_2 (2.31%), T_1 (2.05%), and T_0 (1.97%), respectively.

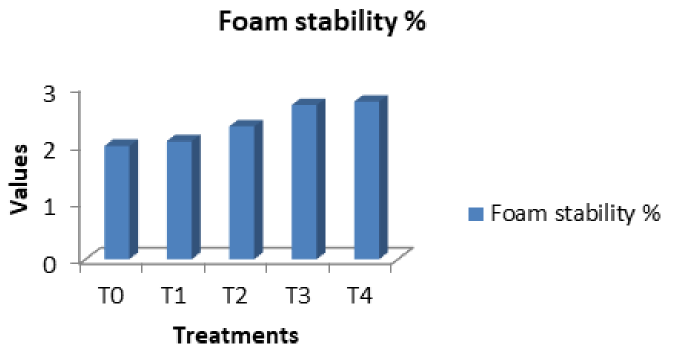

Fig.5: Foam stability (%) of composite flour

The emulsion activity of composite flour, ranged from 44.86 to 63.78%. The value of emulsion activity was found in T_4 (63.78%) followed by T_3 (58.69%), T_2 (51.47%), T_1 (49.11%), and T_0 (44.86%), respectively.

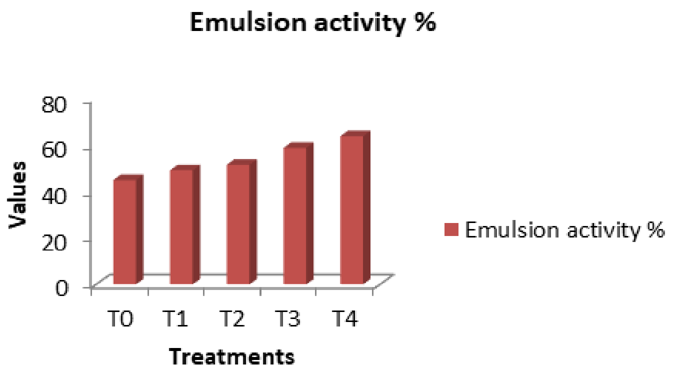

Fig.6: Emulsion activity (%) of composite flour

The emulsion stability of composite flour ranged from 37.16 to 49.82%. The value of emulsion stability was found in T_4 (49.82%) followed by T_3 (47.94%), T_2 (45.05%), T_1 (42.38%), and T_0 (37.16%), respectively. In the case of composite flour, emulsion stability of flours increased with an increase in the level of incorporation ratio of pumpkin flour and pumpkin seed flour in wheat flour [7].

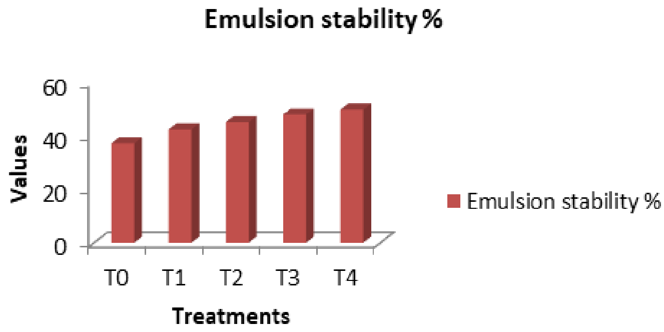

Fig.7: Emulsion stability (%) of composite flour

Bulk density measures the heaviness of flour samples. It is a property that determines the porosity of a product which influences the design of the package. The bulk density of composite flour ranged from 0.78 to 0.91%. The value of bulk density were found in T_4 (0.91%) followed by T_3 (0.87%), T_2 (0.83%), T_1 (0.81%), and T_0 (0.78%), respectively.

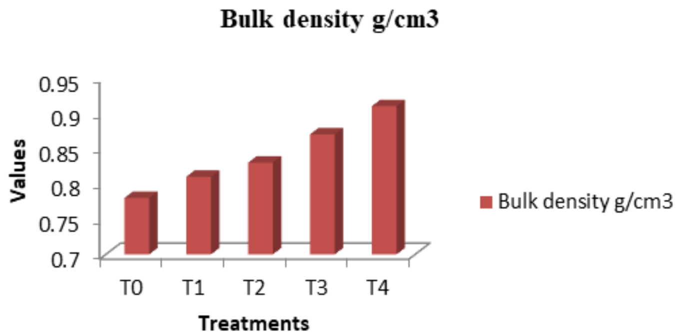

Fig.8: Bulk density (cm^3) of composite flour

CONCLUSIONS

In this research, the functional properties of composite flours such as swelling capacity, water absorption capacity, oil absorption capacity, foam capacity, foam stability, emulsion activity, emulsion stability, and bulk density were increased with an increase in the incorporation of pumpkin flour and their seed flour with wheat flour. The result showed that the T_4 has the highest functional properties as compared to others.

REFERENCES

[1] Al-Khalifa, A.S. (1996). Physico-chemical characteristics, fatty and composition and lipoxygenase activity of crude pumpkin and melon seed oils. *J. Agric. Food Chem*. 44: 964-66.

http://dx.doi.org/10.53709/CHE.2021.v02i04.012

[2] Baljeet, S.Y., Ritika, B.Y. and Roshan, L.Y. (2010) Studies on functional properties and incorporation of buckwheat flour for biscuit making. *International Food Research Journal* 17: 1067-1076.

[3] Chandra, S. and Samsher (2013). Assessment of functional properties of different flours. *African Journal of Agricultural Research,* 8 (38). 4849-4852.

[4] Fennama, R.O. (1996).Food Chemistry (3rd eds) Basel, Hong Kong: Marcel Dekker Inc. New York; pp. 36–39.

[5] Jones, D., Chinnaswamy, R., Tan Y. and Hanna (2000). Physico-chemical properties of ready-to-eat breakfast cereals. *Cereal Foods World* 45:164-168.

[6] Kaur, M. and Singh, N. (2006). Relationships between selected properties of seeds, flours, and starches from different chickpea cultivars. *Int. J. Food Prop.*vol. (9):597-608.

[7] Kaushal, P., Kumar, V. and Sharma, H.K. (2012). Comparative study of physico-chemical, functional, antinutritional and pasting properties of taro (*Colocasiaesculenta*), rice (*Oryza sativa*), pigeon pea (*Cajanuscajan*) flour and their blends. LWT-*Food Sci. Technol*.; 48:59–68.

[8] Kinsella, J.E. (1976). Functional properties of protein in food- A survey Crit. Rev. *Food Sci. Nutr*. *vol*.5:219.

[9] MervetEbrahim and EI-Demery (2011). Evaluation of physico-chemical properties of toast breads fortified with pumpkin (*Cucurbita Moschata*) flour. *Faculty of specific Education Mansoura University-Egypt* 1432.

[10] Narayana, K. and Narsinga, R.M.S. (1982). Functional properties of raw and heat processed winged bean (*Psophocarpustetragonolobus*) flour. *J. Food Sci*. 42:534-538.

[11] Okaka, J.C. and Potter, N.N. (1977). Functional and storage properties of cow pea-wheat flour blends in bread making. *J. Food Sci*. 42:828-833.

[12] Siddiq, M., Nasir, M., Ravi, R., Dolan, K.D. and Butt, M.S. (2009). Effect of defatted maize germ addition on the functional and textural properties of wheat flour. *Int. J. Food Prop*. vol.12:860-870.

[13] Sosulski, F.W., Garatt, M.O. and Slinkard, A.E. (1976). Functional properties of ten legume flours. *Int. J. Food Sci. Technol*. 9:66-69.

[14] Tsen, C.C., Peters, E.M., Schaffer, T. and Hoover, W.J. (1973). High-protein cookies. Effect of soy fortification and surfactants. *Bakers Digest*. 47: 34-39.

[15] Yasumatsu, K., Sawada, K., Maritaka, S., Toda, J., Wada, T. and Ishi, K. (1972). Whipping and emulsifying properties of soybean products. *Agri. Biol. Chem*. 36: 729-727.

http://dx.doi.org/10.53709/CHE.2021.v02i04.012