



## THE USE OF PLANT MATERIALS IN CULINARY PRODUCTS OUT OF YEASTED DOUGH

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**Abstract:** *The article deals with the technology of garlic donuts (pampushkas) enriched with schavnat (hybrid of spinach dock or patience dock and Tien Shan sorrel) as a source of plant protein. The influence of schavnat on the technological process and the quality of pampushkas was determined. The organoleptic properties and the physical and chemical properties such as titrated acidity, texture, specific volume, dough fermentation property and viscoplastic properties were investigated. We obtained a «Special pampushkas with garlic» with a high content in plant proteins which could be recommended for balancing the nutrient composition of population diet.*

**Keywords:** *schavnat, schavnat powder, yeasted dough, garlic donut, pampushka, protein, culinary products.*

### 1. Introduction

Around the world millions of people don't get enough protein. Protein and amino acid deficiencies negatively affect the state of health, human performance and longevity. The ways of protein deficiency recovery are the search of new plant sources of food protein and the development of methods to use them for fortification of mass-consumption products. Bakery products, unlike other foods, are the daily products, so it is possible to influence on the diet and human health by regulation of their chemical composition [1, 2].

Among a large number of protein raw materials schavnat as a culture of new generation deserves attention. Schavnat is the species hybrid of spinach dock or patience dock and Tien Shan sorrel. This new long-term culture was selected in the Department of New Cultures of M. M. Gryshko National Botanic Garden

(Ukraine). It contains a large amount of essential nutrients such as ascorbic acid, beta-carotene, minerals, plant protein etc. Schavnat is first among the vegetable plants for the content of protein and vitamins in the early phases. This culture is suitable for complex use as food, feed, energy, medicinal and plant for technical use.

Schavnat as early spring culture is characterized by high ecological plasticity, winter and frost hardiness, productivity, food, feed, technical and medicinal properties in different climatic and geographical zones.

Its high food and feed properties are noted in the periods of growth, shooting and bud-formation. During this period the overground mass (12...18 % on a dry matter) contains about 30...40 % of protein, 700 mg% of ascorbic acid and 60 mg% of carotene. The content of nitrogen-

free extractive substances is between 35 and 55 %, among them about 6...20 % of sugars. The number of lipids in the green mass is negligible (about 2.8...6.2 %) [3,4]. The use of such plant material as schavnat in the technologies of culinary products out of yeast dough is timely and topical [5].

## 2. Materials and methods

### 2.1 Materials

In the laboratory of the Department of Molecular and Avantgarde Gastronomy of National University of Food Technologies (Ukraine) the culinary products out of yeast dough such as garlic donuts (pampushkas) were baked. Dry schavnat was added in the amount of 0.5...1.0 and 1.5 % of the flour weight for fortification of the products by plant protein. The moisture content of the yeasted dough was 42 %. The fermentation time of dough was 60 min at the temperature of proofer about  $30 \pm 2$  °C. Pampushkas were baked at the temperature of 210 to 220 °C with sprinkling of the baking oven. The weight of dough piece was about  $30 \pm 1$  g each.

### 2.2 Methods

The influence of schavnat on the indicators of the technological process and the quality of finished products was investigated. After baking the organoleptic properties and the physical and chemical properties such as titrated acidity, texture, specific volume and moisture content of the finished culinary products were determined.

The protein content of schavnat and the culinary products was determined by the modified Kjeldahl method. Modification of the method was in determination of the nitrogen content directly in the solution of the ashing sample (without pre-distillation) with using indirect hypochlorite and iodometric titration. The mineralizing of the sample was made by the Kjeldahl method with the mixture of potassium sulphate and copper (II) sulphate. Peroxide of hydrogen was used for catalyzation the

ashing.

The titrated acidity of semi-finished product (dough) was determined by the titration method. The viscoplastic properties of dough were investigated by the degree of dough running and the dynamic of specific volume of dough during fermentation.

The dough running was determined by the method based on the changes in the diameter of the dough balls with the weigh of 100 g during fermentation at the temperature of 30 °C for 180 min.

The dough portion with the weigh of 50 g was put in the graduated cylinder with a capacity of 250 cm<sup>3</sup> and then was put in the thermostat with the temperature of 30 °C for determination of the dynamic of specific volume. The start value of the specific volume and the changes during fermentation were fixed [6, 7, 8].

### 2.3 Technology of pampushkas enriched by schavnat

The technology of «Special pampushkas with garlic» is presented in Fig. 1.

## 3. Results and discussion

The research of the granulometric composition of dry schavnat was shown that the optimal size is 0.4...0.5 mm for the good organoleptic indicators and minimal protein loss (Fig. 1).

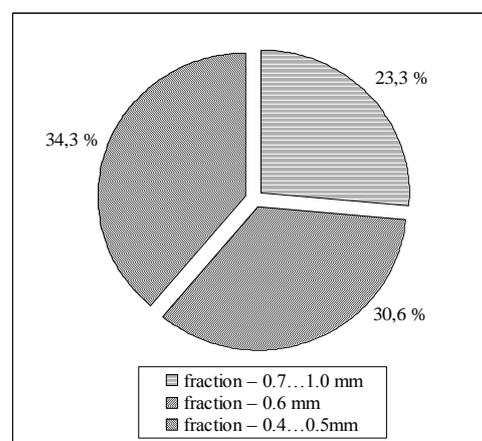


Fig. 1. Dependence of protein content from fractional composition of schavnat powder

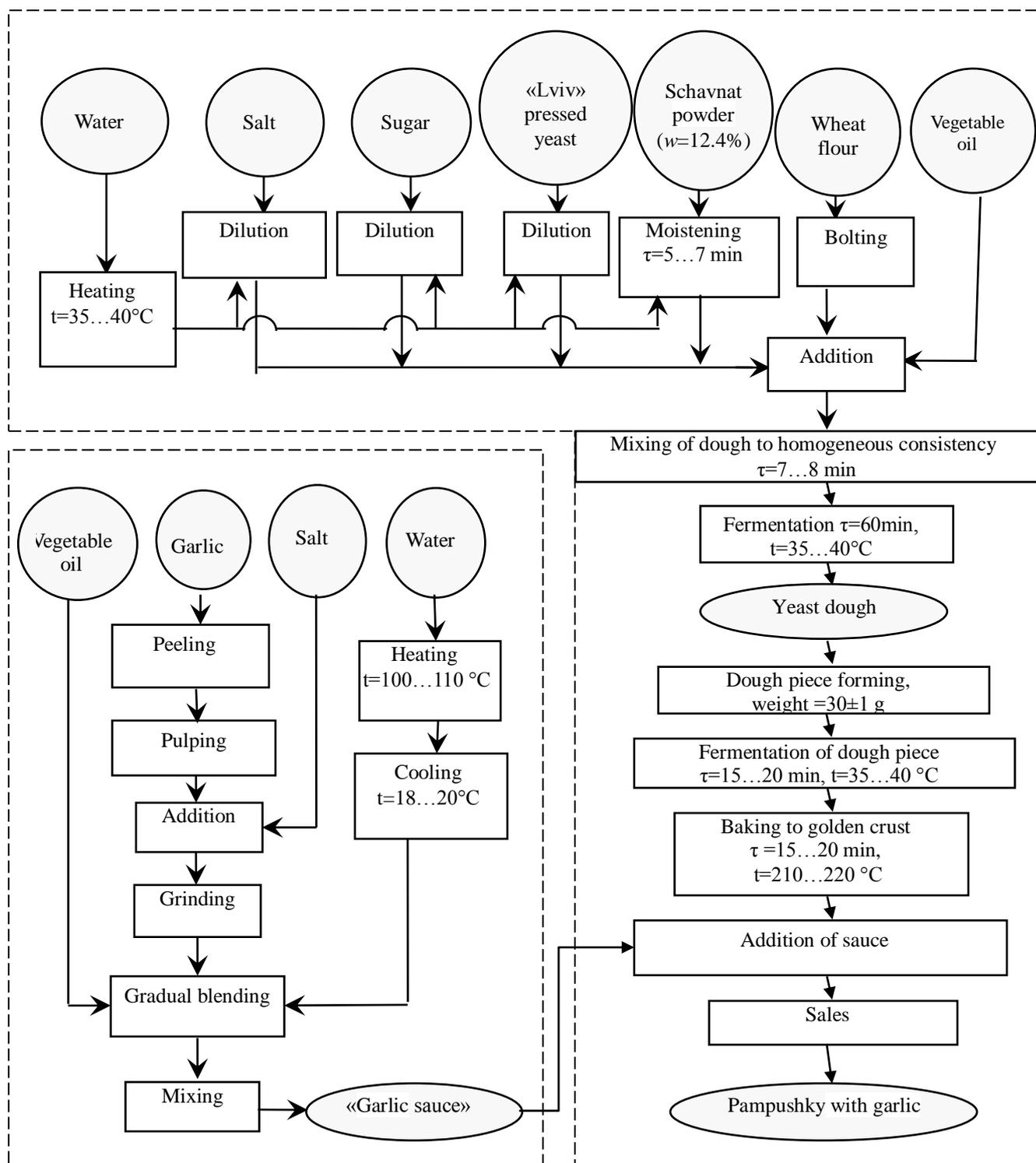
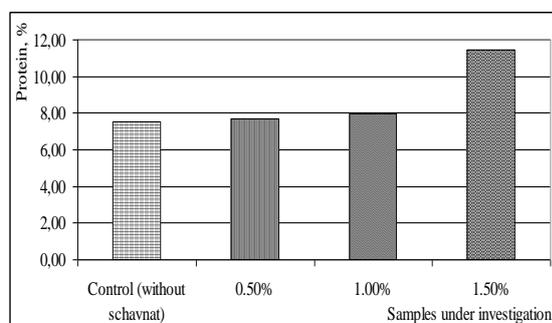


Fig. 2. The technological scheme of «Special pampushkas with garlic»

The protein content is directly proportional to the particle size of fractions. Thus, the fraction of schavnat with the particle size of 0.4...0.5 mm contains the most amount of protein (34.3%), and the fraction with the largest particle size of 0.7...1.0 mm contains only 23.3% of protein. The schavnat fraction with the smallest particle size should be used for enrichment of pampushkas by protein.

The protein content was determined in the finished products with the addition of 0.5%, 1.0% and 1.5% of schavnat powder (Fit. 3). The protein content of pampushkas is directly proportional to the additive of schavnat powder.



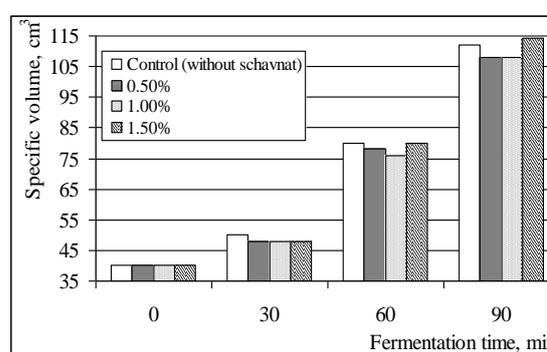
**Fig. 3. The protein content in the finished product (pampushkas) with the additive of schavnat powder**

The finished products with the addition of 0.5% of schavnat powder contained 7.71% of protein, with the addition of 1.0% – 7.98% of protein, with the addition of 1.5% – 11.44% of protein.

The research results of organoleptic and technological indicators of the finished products with the additive of schavnat were presented in Table. 1.

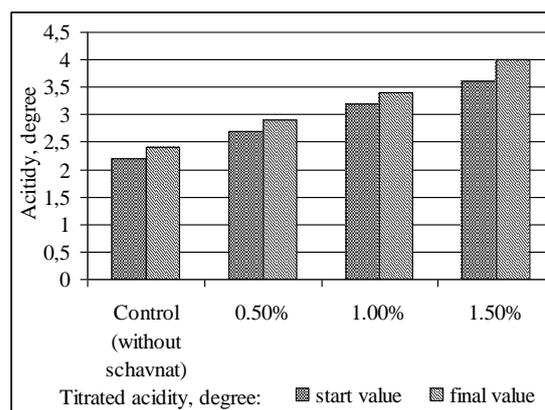
The organoleptic quality of pampushkas did not change significantly with the addition of schavnat in the amount from 0.5 to 1.0% compared to the control, but the colour and surface crust, texture and elasticity were slightly worse with the addition of schavnat in the amount of 1.5%. It was noted the pleasant slightly

acid flavour of the finished products. The schavnat additive decreased the specific volume and texture of the finished products (Fit. 4). Thus, it was established that pampushkas with the addition of schavnat powder in the amount from 3,5 to 13% had the decreased specific volume compared to the control sample (without schavnat). And the texture indicator of pampushkas has been decreasing with the dosage of schavnat powder from 1.05 to 9.17%.



**Fig.4. Dynamic of specific volume of dough with the additive of schavnat powder**

The research results were shown that the start value of titrated acidity was increased slightly with the using of schavnat products (Fig. 5).



**Fig. 5. Titrated acidity of dough with the additive of schavnat powder**

Table 1

The influence of schavnat on the technological process and the quality of pampushkas

Indicator	Control	Dosage of schavnat in the dough, % of flour weight		
		0.5	1.0	1.5
1	2	3	4	5
<b>Dough</b>				
Mixing time, min	8	8	8	8
Fermentation time, min	60	60	60	60
Proofing time, min	30	30	30	30
Baking time, min	25	25	25	25
Titrated acidity, degree	2.2	2.7	3.2	3.6
final value	2.4	2.9	3.4	4.0
<b>Finished products – pampushkas</b>				
Titrated acidity, degree	2.0	2.6	2.8	3.4
Texture indicator, %	80	79	78	76
Specific volume, cm <sup>3</sup>	3.07	2.89	2.72	2.61
Crusts colour	golden			brown
Surface crust	smooth			rough
Texture	medium, uniform			compacted
Elasticity	medium			medium, compacted
Flavour	inherent to pampushkas	sour flavour with increasing the dosage of schavnat powder		

The dough fermentation property was investigated by the floating dough ball (Fig. 6).

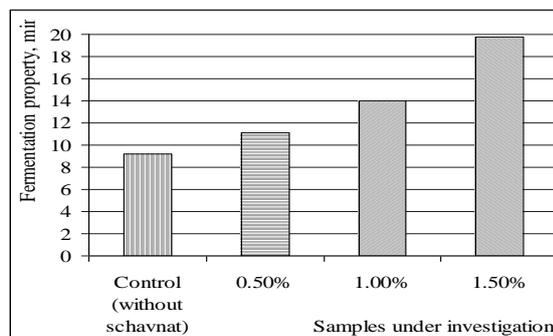


Fig. 6. Investigation of dough fermentation property with schavnat powder

The research results were shown that the incensement of the additive of schavnat powder decreased the dough fermentation property, but within the established norms for bakery products.

The dynamic of dough ball running was investigated for establishing the nature of the impact of schavnat on viscoplastic

properties of semi-finished products (Fig. 7).

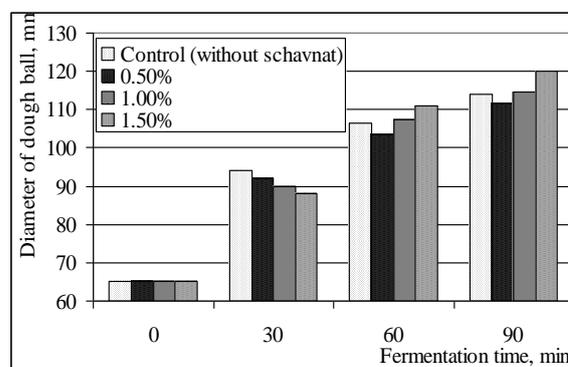


Fig. 7. Investigation of viscoplastic properties of dough with schavnat powder

The dough ball running describes the state of protein and proteinase complex during autolysis. It was found that schavnat improved the viscoplastic properties of dough. The addition of dry schavnat increased the water absorbing capacity and reduced the ability to dough running during fermentation.

#### 4. Conclusion

The fortification of food products by schavnat is appropriate and relevant to the development of new products with a high content of plant protein. It was proposed the technology of «Special pampushkas with garlic» that could be recommended as a garnish for soups, such as borsch or rassolnik. Such fortified pampushkas could balance the food diet by protein of plant origin.

#### 5. References

- [1] MARINA N.V., NOVOSELOVA G.N., SHAVNIN S.A. Products with increased biological value out of non-traditional plant raw materials, *News of the Samara Scientific Center of the Russian Academy of Sciences*, Vol. 12, 1(8), 2079-2082 (2010).
- [2] CONSTANDACHE M. The influence of fortification of bread with exogenous proteins on the protein digestibility, *Journal of Agroalimentary Processes and Technologies*, Vol. XIII, 2, 461-466 (2007).
- [3] RAXMETOV D.B., RAXMETOVA S.O. Schavnat: vegetables, food, and phytofuel, *Grain*, 3, 62-71 (2011).
- [4] BAZHAJ-ZHEZHERUN S.A., RAXMETOV D.B. Schavnat is a promising raw material for the production of health products, *New ideas in food science – new food products for industry: international scientific conference devoted to the 130th anniversary of the National University of Food Technologies*, 167 (2014).
- [5] YERMOLENKO M., ARPUL O., SYLCHUK T. The use of alternative raw materials at restaurants, *Scientific achievements of young people – solving the problems of human nutrition in the XXI century: the program and materials of 80 international scientific conference of young scientists and students*, Part III, 473-475 (2014).
- [6] MARÍA E. MATOS, TERESA SANZ, CRISTINA M. ROSELL. Establishing the function of proteins on the rheological and quality properties of rice based gluten free muffins, *Food Hydrocolloids*, Vol. 35, 3, 150-158 (2014).
- [7] SOLINA M., JOHNSON R.L., FRANK B. WHITFIELD, Effects of soy protein isolate, acid-hydrolysed vegetable protein and glucose on the volatile components of extruded wheat starch, *Food Chemistry*, Vol. 104, 4, 1522-1538 (2010).
- [8] DROBOT V.I., ARSENYEVA L.Yu., BILYK O.A. etc. Laboratory workshop on technology of bakery and macaroni production. Kyiv: Center of educational literature, 341 (2006).