

Yeast Growth in Spelta Wheat Worts

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Abstract – It was investigated that the rate of yeast growth in spelta wort is greater than in common wheat wort. This is due to the chemical composition of the wort. Possibility of effective growing of yeast in spelta wort with the purpose of their using in alcohol technology was shown.

Keywords – yeast, *Triticum spelta* L., common wheat, wort, enzymes, growing.

Introduction

Yeast is an important microorganism which reduces carbohydrates into carbon dioxide and ethanol. The propagation of active maintain yeast and its importance in alcohol technology has been going on for a long time and is still an active research area. Therefore, the conditions used for propagating and maintaining yeast need not be identical to those used for fermenting grain wort.

The most important factors affecting the growing and maintaining of yeast are oxygen, pH, temperature and wort composition. Wort composition determines yeast growth and fermentation performance and is important in maintaining and storing viable, stable yeast. In terms of fermentation, wheat wort contains most of the ingredients necessary for fermentation. Problems arise only if the nitrogen composition is low. In terms of generation, the closer the starter medium is to the fermentation wort the better.

Wheat wort with higher concentrations works well for most fermentation and is recommended for use in most cases of alcohol production, but it does not contain enough nutrients to grow yeast. Thus, the research has established that the generation of yeast on a grain wheat (concentration 19%) provides the best degree of carbohydrate conversion and biosynthesis of alcohol [1]. The addition of yeast nutrients (amino acid/peptide and vitamin) and certain salts can also improve yeast growth and are a worthwhile addition to starters. Thus starter worts should be supplemented with yeast nutrients so that nitrogen is not limiting.

Triticum spelta L is an alternative culture with undermanding growing requirements. Spelta shows a very good adaptability. According to [2] it belongs to the ecological crops. The use of spelta wheat can solve both the problem of growing yeast and the expansion of grain raw materials sources in the alcohol production. Also spelta is used in other branches of the food industry [2,3] Spelta contains more protein, fats and vitamins than common wheat. Therefore, an important problem is the study of yeast growth in a spelta wort.

Materials and Methods

The experimental materials comprised cultivars of common wheat (*Triticum aestivum*), and spelta wheat (*Triticum spelta* L.) were obtained from Ukrainian Research Institute of Selection. The grains were hammer milled in a laboratory mill fitted with 1 mm opening screen. In this study used commercial («SternEnzym») *Saccharomyces cerevisiae* yeast Quickferm Super and commercial enzymes («Danisco»): Amylex 5T (alpha-amylase), Diazyme SSF (glucoamylase), Laminex BG2 (source of cellulase). Wort was inoculates with 0,1 g/L of dry yeast slurry and this was estimated to give an initial yeast count of 18-20*10⁶ viable cells/mL Yeast propagations were carried out in flasks capped with cotton wool at 30 °C for 24 hours. The number of yeast cells was determined by Goryaev chamber.

Results and Discussion

The wort preparation modes for fermentation are determined in a previous study. In this work the spelta wort was obtained using enzymes Amylex 5T, Diazyme SSF and Laminex BG2 for the hydrolysis of non- starchy polysaccharides contained in the filmy part of the spelta grains. The thermo-enzymatic treatment conditions of spelta were established: the temperature of batch preparation 46 ± 1 °C, the duration of liquefaction 2,5 hours at a temperature of 79 ± 1 °C, saccharification – 30 min at 56 ± 1 °C. Common wheat wort (control) was obtained under similar conditions.

The dynamics of yeast cell count during the generation shown on fig.1 It indicates that the largest yeast number is observed in wort obtained using spelta. Yeast content in spelta wort is higher as compared with the control (common wheat worts) sample by 12 - 15%. Yeast growing in spelta wort showed a more rapid generation at the first hours (4-8 h) and then slow growth rate by 16 hours generation (fig 2). The growth rate of yeast at the beginning of the process (4-8 hours) increased by 20% compared with control.

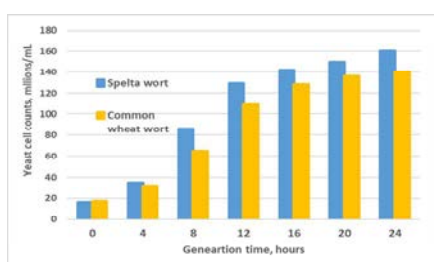


Fig.1. Effect of spelt wort on yeast cell number.

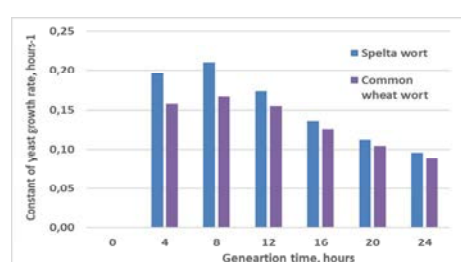


Fig.2. Rate of yeast growth

The best experimental results of the study of the yeast growing in spelta worts compared to control can be explained as follows: the nutritive value of spelta wheat is higher and contains all the basic components such as proteins, saccharides, lipids, vitamins and mineral. Lysine is contained in more quantities in the spelta than in common wheat. This amino acid was chosen because it is a Group A, meaning that it is among the first amino acids assimilated by yeast [4]. They are useful for preparing a nutrient medium for yeast growth.

Conclusion

In this paper, the results demonstrated a possibility of effective growing of yeast in spelta wort with the purpose of their using in technological processes. Thus, the use of spelta wort for the yeast generation at the expense of nutrients can increase the rate of yeast growth.

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