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UV STERILIZATION OF HONEY

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Abstract

The objective of this study was to find a method for sterilize honey without facing the loss of compounds responsible for the flavour and aroma. Different types of honey were subjected to UV and inoculated on DRBC agar cultures.The samples, with different refractive index, were expose under UV 365 nm light for 15 min.The agar cultures for UV sterilise samples come clean – with no trace of yeasts or mold that could affect the fermentation process or infected the final product.

Keywords: UV process, honey, mead production, sterilize process

INTRODUCTION

Mead is wine that is made with honey rather than grapes and it has a distinct sweetness and full bodied richness that can't be had from grape derived wine. It belongs to the family of fermented alcoholic beverages.Mead contains 8-18% (v/v) ethanol, obtained by the alcoholic fermentation of diluted bee honey with an appropriate amount of water.

Mead fermentation is a time-consuming process, often taking several months, and the fermentation rate depends on several factors, especially on honey variety, yeast strain, yeast nutrition, control of pH (Navrátil et al., 2001).Honey fermentation is very flexible and so it's hard to obtain a balanced and harmonized honey must in order to obtain a good beverage. Traditional mead consists of honey, water, yeast, and optional additives; each represents a specific control point. Honey is the main flavor component of any mead and should be carefully considered. A good honey makes a good mead. In order to have a safe fermentation we have to sterilize the main raw material, honey, so we have a sterile environment, without affecting honey's specific properties such as organoleptic or physical and chemical properties. The sterilization process is not the easiest way in mead making process but it is what helps in producing the best and for sure final product – honey "wine".Today, most of the products are pasteurised to obtain microbiologically safe and nutritious products. However, pasteurisation can change the taste and flavour of such products because of the temperature and processing time(Guerrero-Beltran and Barbarosa-Canovas, 2004).With the growing of negative public's reaction over chemicals added to foods, UV light holds considerable promise in food

processing as an alternative to reduce the most microorganisms of public health significance. Considering that, we've tried to use UV light to sterilize honey, in order to have a secure, save and microorganisms free fermentation environment.UV light basically works by disrupting the DNA and other reproductive molecules in harmful bacteria. In general, using UV light treatment for food has been found not to cause any adverse effects, especially if UV light is applied in moderate amounts (Krishnamurthy 2006).

Aims

The ideal situation for mead-making is to have only one species of microorganism ever present in the wine – which is the selected yeast for fermentation. However, by the very nature of the sheer abundance of microorganism present in the environment this ideal situation is never realized (Spedding Gary, 2000).There are several methods used for sterilization.Non-thermal technologies (NTP) are processing methods for achieving microbial inactivation without exposing foods to adverse effects of heat whilst extending product shelf life and retaining their fresh-like physical, nutritional, and sensory qualities (Ade-Omowaye et al., 2001). UV light (254 nm) can be used to inactivate many types of organisms, including viruses and has been used for many years in pharmaceutical, electronic, and aquaculture industries as a disinfection medium. Microorganisms exposed to UV light are affected at the DNA (deoxyribonucleic acid) level. Thus, the injured reproduction systems of cells lead to their death. Exposure to UV light can be applied at different doses for pasteurization of liquid foods or disinfection of solid foods (Guerrero-Beltran and Barbosa- Canovas, 2004).

In recent years, the UV sterilization is taken notice as a sterilization method that does not change the quality of the product. The aim of this study was to sterilize the raw material used in wine production which is honey in order to prevent possible faults due to microbiological contamination during fermentation process. In a previous study we've tried rapid freeze sterilization, but we've decided to call a most viable and economical method – the UV sterilization method.

MATERIAL AND METHOD

This study was conducted in the Department ofTechnological Sciences – Animal Breeding of USAMV in partnership with food-biochemistry laboratory of the Faculty of Environmental Protection of the University of Oradea in August 2014. We used 5 types of honey: manna honey, polyfloral honey, linden honey, polyfloral candied honey and linden candied honey. Those types were molten in Petri dish 1 cm high. The

samples were expose under UV 365 nm light for 15 min. Also, I had determinate the index of refraction at 20°C for every sample of honey with Mettler Toledo RE 40 refractometer. After the 15 min of sterilization was completed, the samples were diluted at 10^{-1} and inoculated on DRBC agar cultures.

RESULTS

The results have showed complete sterilization effects on DRBC agar cultures by UV honey exposure after 15 minutes. Therefore, UV can be used as a sterilization solution. Even if the refractive index of the samples was different the sterilisation was successful for every type of honey. The refractive index was:
- manna honey – 1,4979
- linden honey – 1,4921
- polyfloral honey – 1,4965
- linden candied honey – 1,4935
- polyfloral candied honey – 1,4932

CONCLUSION

Ultraviolet technology is an non-chemical approach to sterilization. There is still a lot of room for research and improvement in this area and it is crucial that studies are conducted on variables such as flow rate, exposure time, type of product, colour of fluid and composition of the beverage in order to ensure reduced microbial load, increased shelf life and nutritious with acceptable taste (Mohd and Benchamaporn, 2007) . In this method nothing is added which makes this process simple, inexpensive and requires very low maintenance. There are three regions of ultraviolet light within the electromagnetic spectrum. These are the UV-A (315–400 nm), UV-B (280–315 nm) and UV-C (200–280 nm). UV light exhibits germicidal properties in the UV-C region. The inactivation efficiency follows a bell-shaped curve where maximum inactivation occurs approximately at the range of 254 to 264 nm. However, typical mercury UV lamps deliver at 254 nm maximum. Therefore, it is usually mentioned that UV inactivation is at 254 nm (Choudhary and Bandla, 2012). This research has proven UV-A light's ability to inactivate an extensive list of microorganism that we find in mead's main raw material – honey. UV offers a key advantage over boiling or fast-freezing methods of sterilization, due to its safety benefit and it doesn't create new long term costs for administration, management risk or electrical consumption compromise. UV systems are affordable as they require low initial investment and a lower operating cost of treatment (Yuan et al. 2004).

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