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Research and Studies on Vinegar Production-A Review

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ABSTRACT

Vinegar is the product obtained exclusively through biotechnological processes such as double fermentation, alcoholic and acetic fermentation of liquids or other substances of agricultural origin. There are various types of vinegars obtained from various sources such as wine fruit and berry, cider, alcohol, grain, malt, beer and honey. Vinegar is used as a food additive and also it acts as effective preservative against food spoilage. Various investigators have carried out investigations on vinegar production from various raw materials such as fruits, fruit peels, and many other agricultural feed stocks. The present review summarizes research and studies carried out on vinegar production from various raw materials.

Keywords: Fermentation, Yield, Fruit Waste, Treatment, Properties.

I. INTRODUCTION

Chemical and biochemical engineering is ever evolving field because of the technological advancements and scope for cost reduction. Obtaining the product by using environmental friendly method is the need of chemical industry. The process can be optimized by studying effect of various parameters on it. Also use of alternative raw material can optimize the process. Investigations on production of ethanol have been reported by using different raw materials [1, 2, 3, 4].

Production of glucose, starch has also been reported[5,6]. Products such as lactic acid, citric acid are also of interest and investigation has been reported on research on them[7,8,9,10,11,12]. Vinegar is one important product mainly in food industry. It is widely used as preservative.Various investigators have carried out research on production of vinegar by using different raw materials and at different operating conditions. The present review summarizes review on research and studies on production of vinegar from various raw materials.

II. REVIEW ON PRODUCTION OF VINEGAR

Minh investigated Fermentation of star fruit juice to produce vinegar using the yeast saccharomyces cerevisiae and acetobacter aceti bacteria [13]. He used Star fruits collected in rural area of Tra Vinh province, Vietnam. He observed that at ethanol concentration of 10%, the acetic acid formation was maximum. At pH value of 3.5 fermentation was optimum. According to his studies, the most common technology used in the vinegar industry is the feed-back method to increase the speed of the acetic acid biological reaction.

Vinegar Production from pineapple wastes was carried out by Roda et.al.[14]. Their research was aimed at completely processing pineapple wastes into vinegar which may be then used as dressing, food preservative, and disinfectant. They cut and chopped the fruit waste then divided it into samples of peel and core. Then distilled water was added. For changing sugar yield, they arranged physical treatments in order to disaggregate the fibrous structure followed by enzyme treatments to breakdown cellulose polymers and to hydrolyze sucrose. Also invertage was added. They obtained more than 100 g of reducing sugars per kg of fresh peels and about 330 g of reducing sugars per kg of fresh core.Praveena and Estherlydia carried out studies on phytochemical screening and antioxidant capacities of vinegar made from peel and fruit of pineapple [15]. They produced vinegar from the peel and fruit of pineapple, sugar and starter culture. They assessed the phytochemical properties and antioxidant activity of pineapple peel vs fruit vinegar. They obtained yellow colored vinegar from the pineapple fruit mixture. They observed that the

antioxidant content of peel vinegar (2077 mg acetate equivalence/100 ml) was higher compared to that of fruit vinegar. They concluded that pineapple peel vinegar can be produced in large scale and marketed for its therapeutic effects.Dabija and Hatnean summarized research concerning the quality of vinegar made from apples, Florina assortment, harvested from Suceava county area[16]. Their study indicated that apple vinegar is obtained through double fermentation.They also found that the quality of vinegar depends on the factors such as the raw material used, the technological process adopted, the technological equipment supplied, acetic bacteria species used etc. An investigation intended at enhancement in the acetic acid production and the antioxidant activities (AOA) of Roselle vinegar using mixed culture fermentation was carried by Kongkiattikajorn[17].He produced the Roselle wine in a batch reactor. He determined total phenolics, total anthocyanins, and antiradical activity (1-1 diphenyl-2-picryl hydrazyl radical-scavenging (DPPH) method).He observed that acetification increased the total anthocyanin content, total polyphenols and antioxidant activities. He concluded that fermentation is a better method for obtaining higher antioxidant activity of Roselle products.

Decomposed Fruits were used for screening of acetic acid producing microorganisms by Diba et.al.[18]. They collected acetic acid bacteria capable of growing at 30˚C - 37˚C from various decomposed fruits. They isolated 42 microorganisms and checked their growth in YPG medium containing various ethanol concentrations at different time point at 37˚C.They determined acetic acid production rates by titration method. Their analysis indicated that their collection contained huge amount of acetic acid producing bacteria. Krusong and Vichitraka investigated simultaneous pineapple vinegar fermentation interaction between acetic acid bacteria and yeast[19].They observed that there are two biological interactions between yeast and AAB in this simultaneous pineapple vinegar fermentation. Commensalism, occurred during the early stage of fermentation as yeast-M30 provided alcohol to AABWK for further oxidation. During simultaneous pineapple vinegar fermentation (SPVF), it was observed that there was a positive effect of oxygen on yeast- M30's ability to produce more ethanol. MacKay et.al. Carried out studies on potential of chemicals and pharmaceuticals obtained from wood feedstocks, including a food additive, with a focus on activities currently taking place in Maine[20].According to them, there is renewed interest in using wood and carbohydrates as a feedstock. Concerns about oil and gas feedstock prices, carbon emissions, and declining levels of non-renewable resources are driving factors for developing interest in chemicals and pharmaceuticals from woody biomass. According to their studies a substantial amount of research remains on the optimal way to produce chemicals and pharmaceuticals. Kumbha et.al. studied biodegradation of the vinegar effluents by mixed culture bacteria isolated from the soil[21].According to their studies, acetic acid in the vinegar plant effluent contaminates the water and soil and erodes if the effluent is released into the soil.They used aerobic biodegradation to remove biodegradable matter. They analyzed samples for vinegar concentration, DO, salinity, electrical conductivity. They concluded that the aerobic biodegradation by using fluidized bed reactor was an appropriate approach to treat vinegar effluents. Byarugaba-Bazirake et.al. used banana peels, which had adequate starch remaining in them, to process the vinegar[22]. They separated the extract from pieces, boiled to gelatinize the starch by muslin-cheese cloth, and fermented by adding wine yeast. Their study indicated that matooke peels can be used as an ideal substrate for production good quality vinegar.Budak et.al studied functional properties of vinegar[23]. They carried out review of research on these fermented products. It indicated numerous reports of health benefits derived by consumption of vinegar components. They discussed vinegar history, production, varieties, acetic acid bacteria, and functional properties of vinegars. According to these studies acetic acid is the dominant flavor compound in vinegar. It also found to have the potent bioactive effects which may benefit human health. The therapeutic properties of vinegar include antibacterial activity, blood pressure reduction, antioxidant activity, reduction in the effects of diabetes, and prevention of cardiovascular disease.

III. CONCLUSION

Vinegar is very important food preservative in food industry. The vinegar can be obtained various raw materials such as various fruits and fruit peels. Various agricultural waste materials can also be used as raw

materials. It was observed during various investigations that enzymatic treatments of pineapple wastes had a significant effect on the saccharification process. Also review indicated that Pineapple peel vinegar had comparatively high total phenol content and antioxidant activity. Apple vinegar was also obtained through classical methods by few investigators. It was also found that that fermentation is a better method for obtaining higher antioxidant activity of Roselle products. It can be concluded that, to produce chemicals and pharmaceuticals in optimal way, still substantial amount of research is needed.

IV.REFERENCES

[1] Patanjali Varanasi, Priyanka Singh, Manfred Auer, Paul D Adams, Blake A Simmons,and Seema Singh(2013), Survey Of Renewable Chemicals Produced From Lignocellulosic Biomass During Ionic Liquid Pretreatment, Biotechnology for Biofuels, 6, (14), 1-9.

[2] Sunil J. Kulkarni, Nilesh L. Shinde, Ajaygiri K. Goswami(2015), A Review on Ethanol Production from Agricultural Waste Raw Material,International Journal of Scientific Research in Science,Engineering and Technology, 1(4),231-233.

[3] Ajay Kumar Singh, Sanat Rath, Yashab Kumar, Harison Masih, Jyotsna K. Peter, Jane C. Benjamin, Pradeep Kumar Singh, Dipuraj, Pankaj Singh(2014), Bio-Ethanol Production from Banana peel by Simultaneous Saccharification and Fermentation Process using cocultures Aspergillums Niger and Saccharomyces cerevisiae, Int.J.Curr.Microbiol.App.Sci,3(5), 84-96.

[4] Nibedita Sarkar, Sumanta Kumar Ghosh, Satarupa Bannerjee, Kaustav Aikat(2012),Bioethanol Production From Agricultural Wastes: An Overview, Renewable Energy, 37, 19-27.

[5] Veena Ramachandran, Nisha Pujari, Tanmay Matey, Sunil Kulkarni(2014), Enzymatic Hydrolysis of Cassava using wheat seedlings, International Journal of Science, Engineering and Technology Research (IJSETR), 3(5), 1216-1219.

[6] Veena Ramachandran, Nisha Pujari, Tanmay Matey, Sunil Kulkarni(2013), Enzymatic Hydrolysis for Glucose-A Review, International Journal of Science, Engineering and Technology Research (IJSETR), 12(10), 1937-1942.

[7] Abesh Bera, Siddhartha Verma and Suneetha V(2013), Estimation And Economic Analysis Of Citric Acid Extracted From Vegetative Wastes Collected From Vellore, Der Pharmacia Lettre, 5(3), 58-64.

[8] Se-Kwon Kim, Pyo-Jam Park, and Hee-Guk Byun, Continuous Production of Citric Acid from Dairy Wastewater Using Immobilized Aspergillus niger ATCC 9142, Biotechnol. Bioprocess Eng., 7, 89-94.

[9] Pratik Bezalwar, Ashok V. Gomashe, Harshal M.Sanap and Pranita A. Gulhane(2013), Production and Optimization of Citric Acid by Aspergillus niger using Fruit Pulp Waste, Int.J.Curr. Microbiol. App.Sci., 2(10), 347-352.

[10] Miloud Hadadji and Ahmed Bensoltane(2006), Growth and lactic acid production by Bifidobacterium longum and Lactobacillus acidophilus in goat's milk, African Journal of Biotechnology, 5(6),505-509.

[11] Ramesh Chandra Ray, Piyush Sharma and Smita Hasini Panda(2009), Lactic acid production from cassava fibrous residue using Lactobacillus plantarum MTCC 1407, Journal of Environmental Biology, 30(5) ,847-852.

[12] Nguyen Phuoc Minh(2014), Investigation Of Lactic Acid Fermentation From Corn By-Product Using L. Casei And L. Plantarum Strain, International Journal Of Multidisciplinary Research And Development, 1(3),92-100.

[13] Nguyen Phuoc Minh(2014), Utilization Of Ripen Star Fruit For Vinegar Fermentation, International Journal Of Multidisciplinary Research And Development, 1(4),82-93.

[14] Arianna Roda, Dante Marco De Faveri, Roberta Dordoni, Milena Lambri(2014),Vinegar Production From Pineapple Wastes –Preliminary Saccharification Trials, Chemical Engineering Transactions, 37, 607-612

[15] Jasmine Praveena, R. And Estherlydia, D.(2014), Comparative Study Of Phytochemical Screening And Antioxidant Capacities Of Vinegar Made From Peel And Fruit Of Pineapple (Ananas Comosus L.), Int J Pharm Bio Sci 5(4),(B) 394 – 403

[16] Adriana Dabija, Cristian Aurel Hatnean(2014), Study Concerning The Quality Of Apple Vinegar Obtained Through Classical Method, Journal Of Agroalimentary Processes And Technologies, 20(4), 304-310.

[17] Jirasak Kongkiattikajorn(2014), Antioxidant Properties Of Roselle Vinegar Production By Mixed Culture Of Acetobacter Aceti And Acetobacter Cerevisiae, Kasetsart J. (Nat. Sci.), 48, 980 – 988.

[18] Farzana Diba, Fahmida Alam, Ali Azam Talukder(2015), Screening Of Acetic Acid Producing Microorganisms From Decomposed Fruits For Vinegar Production, Advances In Microbiology, 5, 291-297.

[19] Warawut Krusong And Assanee Vichitraka(2010), An Investigation Of Simultaneous Pineapple Vinegar Fermentation Interaction Between Acetic Acid Bacteria And Yeast, As. J. Food Ag-Ind., 3(01), 192-203.

[20] Donald G. Mackay Barbara J.W. Cole Raymond C. Fort Amy Mares(2009), Potential Markets For Chemicals And Pharmaceuticals From Woody Biomass In Maine, Forest Research, Forest Research LLC, 20 Godfrey Drive, Orono, Maine 04473, Website: Www.Forestresearchllc.Com

[21] Subba Rao Kumbha, V Ramanjaneyulu And AVN Swamy(2014), Aerobic Biodegradation Of Vinegar Containing Waste Water By Mixed Culture Bacteria From Soil In Fluidised Bed Reactor, Int. Journal Of Engineering Research And Applications, 4(9), Version 1, 110-113.

[22] G.W Byarugaba-Bazirake, W Byarugaba And M Tumusiime And D.A Kimono(2014), The Technology Of Producing Banana Wine Vinegar From Starch Of Banana Peels, African Journal Of Food Science And Technology,5(1),1-5.

[23] Nilg¨Un H. Budak, Elif Aykin, Atif C. Seydim, Annel K. Greene, And Zeynep B. Guzel-Seydim(2014), Functional Properties Of Vinegar, Journal Of Food Science, 79(5), 757-765.