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**EFFECT OF PROCESSING PARAMETER ON CHEMICAL
COMPOSITION OF OF *SOLANUM TUBEROSUM* EXTRACT**

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Abstract

Solanum tuberosum extract contains a lot of bioactive compounds that have therapeutic purpose. The extraction method that involved different processing parameters are crucial to obtain the bioactive compound from *Solanum tuberosum*. Therefore, this current research presents the study on the effect of processing parameter on *Solanum tuberosum* extract. Taguchi orthogonal array design was employed to determine the effect of processing parameter towards the extraction yield of *Solanum tuberosum*. The processing parameters involved in this study was the drying methods, the type of solvent, the blanching methods and temperature. The highest value in response of S/N ratio indicate the most influential effect towards the extraction yield of bioactive compounds. Then, the results were statistically analysed by using one-way ANOVA. The result obtained showed that the drying method is the most influential factor as compared to the detection method and temperature. While, detection method is more influential as compared to the type of solvent. Other than that, blanching method has the most influence as compared to time and detection method. Also, temperature is more influenced as compared with the detection methods. All these processing parameters which are drying methods, detection methods, blanching methods and temperature showed significant effect with $P < 0.05$ as compared with the other parameters. This current study showed a new insight and information on the extraction of *Solanum tuberosum* extract.

Keywords – Bioactive compounds; *Solanum tuberosum* extract; Potato; temperatures; drying methods; solvents; blanching methods; temperature; Taguchi Orthogonal Array Design

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1. Background of Study

Solanum Tuberosum is a root vegetable crop belongs to a perennial plant of a nightshade family called Solanaceae. It has been recorded to contain the most nutritional content and an important dietary source of bioactive compounds such as carotenoids, polyphenols and vitamins. All these compounds in potato serve various purposes associated to lower the risk of human diseases (Navarre et al., 2010). Moreover, potato can be consumed in many ways and various processing parameters do affect the chemical composition of potato especially to its bioactive compounds (Kourouma et al., 2019) .

The extraction of bioactive compounds under different processing parameters required consideration of various factor such as the method of detection, the time taken and the temperature. Hence, it is essential to carry out variety of experimental works. To reduce the number of experiments efficiently, a statistical design of experiments is adopted (Journal et al., 2016). Therefore, this current study was carried out to determine the optimum processing parameter on the extraction of bioactive compounds of *Solanum tuberosum* extract using Taguchi method. Taguchi methodology can provide a systematic way to optimize design of performance and quality of product through a unique set of orthogonal array design experiment. It also organizes parameters and the level affecting the response with respect to all control factors with minimum number of experimentations.

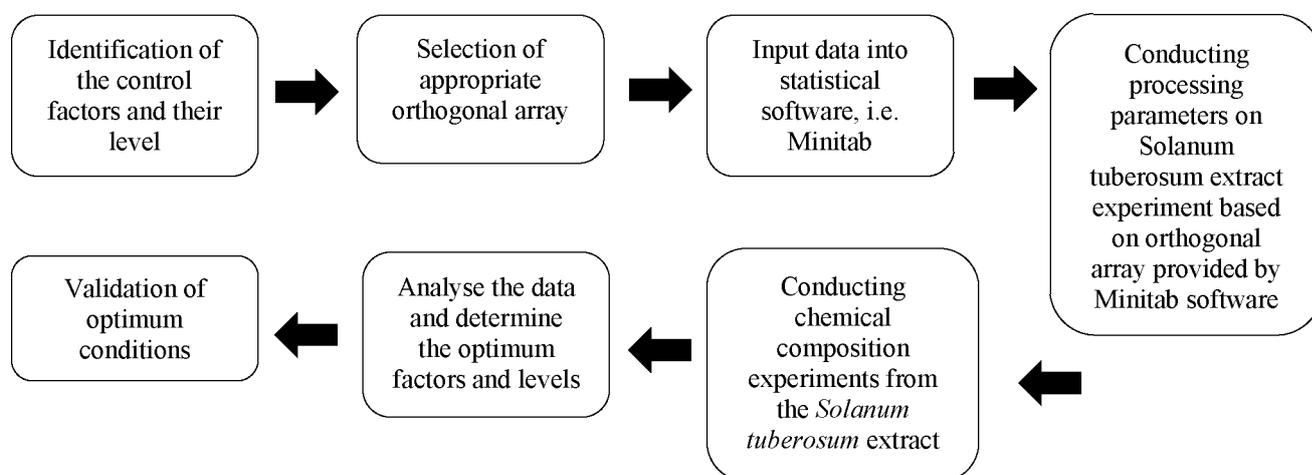


Figure 1. Overview of Taguchi methodology for extraction of bioactive compounds in this study.

1.1 Literature

Drying is an ancient technique used to sustain and extend the shelf life of different food items. (Ratti *et al.*, 2001). The main goal of drying food products is to extract water from solids to a degree where microbial spoilage and chemical reaction degradation are greatly minimized. (Krokida *et al.*, 2003). This allows the product to be preserved for longer periods, as drying prevents the activity of microorganisms and enzymes. (Jayaraman *et al.*, 1992). Drying typically requires the application of thermal energy that induces the evaporation of water into the vapor process. (Di Scala *et al.*, 2008). Air, oven and freeze drying include several drying techniques used for different products. Generally, due to processing costs and efficiency, air-drying and oven drying are favored (Vega-Galves *et al.*, 2009). However, air drying has drawbacks of both long drying time required and poor quality (Therdthai *et al.*, 2009). By far, freezing is considered the most effective process for eliminating moisture with the highest quality final products in comparison to air-drying (Korus *et al.*, 2011).

Solvent extraction is frequently most used technique for isolation of plant with bioactive compound. Anyhow, the extract yield and result of the bioactive compound activity of the plant is depending on the nature of extracting solvent. This is because the different content of bioactive compound with different chemical characteristics that may or may not be soluble in the particular solvent. Basically, polar solvent is used for recovery of phenols from a plant matrix. Other than that, methanol and ethanol have been extensively used to extract the bioactive compound from various of plant and plant based such as fruits, vegetable and etc. According to (Bonoli *et al.*, 2009) the maximum phenolic compounds were obtained from the mixtures of ethanol and acetone. The polarity of the solvent for the different antioxidant compounds affects the efficiency of the extraction and the activity of the obtained extracts. For example, water, methanol, ethanol, acetone, aqueous solutions solvents and ethyl acetate are commonly used as extraction solvents (Shui and Leong, 2006).

Blanching is a popular thermal intermediate treatment which is applied during food processes to improve food preservation and nutritional quality (Oliveira *et al.*, 2016). During blanching, chemical changes can have impact on the bioactive phytochemicals. The timing of blanching and the types of method, however, is important to be optimized for the foods depending on the various susceptibility with thermal processing degradation. Also, the thermal stability of the bioactive compounds do have impact on the rate of degradation during blanching (Huang *et al.*, 2016). There are variety of blanching methods and the most current one is conventional hot water blanching, steam blanching and microwave blanching. Generally, traditional hot water blanching is a process where foods are immersed for several minutes in hot water. Next, steam blanching is a process where steam condenses on the surface of foods in a closed pot and a significant amount of latent heat is transferred. Lastly, microwave blanching is a process where heated foods absorbs microwave energy and converted it as heat. As soon as the blanching methods complete, the blanched foods need to be drained and cooled to preserve the quality (Xiao *et al.*, 2017).