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A CRITICAL REVIEW AND OPINION ON HYDRODISTILLATION

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Abstract

Hydodistillation is a scientific technique used in biological studies. Its reason of usage varies, but its principle of usage is the same. Hydrodistillation uses solvents for extraction, such that solutes (molecules, compounds, atoms, ions, metals, and dissolutes) can be quantified from specific oil extracts. This paper critically reviews and provides opinions on hydrodistillation that advances the present knowledge on hydrodistillation. Also a history behind hydrodisillation and comparisons are provided.

Keywords: Hydrodistillation, technique, apparatus, impact, plant organs

1. INTRODUCTION

Hydrodistillation is a technique used to extract oils, usually essential oils from plants, using a hydrodistillation device or apparatus [Gavalian *et al.,* 2005]. Its success depends on an optimum, and operational, heating device and cooling system [Gavalian *et al.,* 2005; Laid *et al*., 2015]. Although hydrodistillation is a technique, its successful execution in the lab depend on the formation of hydrodistillates (water vapour droplets), rather than only quantities of oils. This is indicative of a successful heating apparatus, as well as, proper inflow and outflow of cold water from the hydrodistillation device. However the extraction relies on some resistance in the hydrodistillation device, particularly, since oils can't be extracted merely upon heating ground, or partially ground, material [3]. Hence from observations of the hydrodistillation device that the coil, through which the inlet and outlet for water flow is, form the vapour droplets through a resistance mechanism [Singh, 2017]. This indicates that the device is operational, and also that the quantity of essential oil produced is not proportional to the density of droplets. This emphasises that hydrodistillation is an extraction procedure requiring water as a cooling medium and that the vapour droplets are an indication of heating, nothing more.

2. A BRIEF HISTORY OF EVENTS THAT LEAD TO HYDRODISTILLATION?

There are a few, but similar, events that lead to hydrodistillation. These are practical ideas that date back to holistic medicine. In the past, and even currently in many rural communities, plants were either used in its natural form, as combinations with other treatments [Singh, 2017; Horman, website], and as extractions from boiling on stoves and fires. From these, many observations were noted. One of such was an observation that the extracts weren't clean, and that although they worked, ear-ache and wound remedies, e.t.c., it was likely that it was due to the many substances they contained, rather than any single active ingredient. This lead to testing these unpurified extracts with bacterium innocula, viruses, sputa, and human cells, like fibroblasts, erythrocytes, and oncogenes, so to check their bioactivity and efficiency [Singh, 2017]. Although these were found to be successful, these finds weren't representative of what happens exactly at the organism level, due to the many substances they had. Also it is possible that traditional healers noted the aroma from their extractions and decoctions. Often these observations were either made, or weren't unnoticed. These events promoted the manufacture of a device or apparatus that extracted particular substances from plant materials; while releasing vapour droplets during heating. These events, thus, lead to hydrodistillates, as part of the hydrodistillation procedure.

3. THE IMPACT OF HYDRODISTILLATION IN RELATION TO OTHER EXTRACTION TESTS IN THE LABORATORY

Hydrodistillation is a deviation of two other techniques, but its impact in the lab is independent of either two. Below its impact in relation to boiling and rotatory evaporation is discussed.

a. *Boiling.*
This technique isn't the least impactful, depending on the laboratory test. In terms of microbiology and cell culture studies, its impact is the lowest, because a lot of pertinent medicinal information about plants are lost. Often it is the best in plant starch tests, since softening of cellulose is obtained, and dyes can easily permeate plant cells [Singh, 2017]. Due to the shortfall, hydrodistillation provide more qualitative results, that would otherwise go unnoticed with boiling [Bousbia *et al*., May 2009].

b. *Rotatory evaporation.*
This technique is more qualitative compared to boiling. It is however incomparable to hydrodistillation. This difference is because hydrodistillation is used for oil extraction, whereas in evaporation no oils are obtained [Singh, 2017]. In evaporation, low quantity of extracts are achieved, however, they may constitute compounds similar to those in essential oils [Rabman and Doulatabadi, 1984; Bousbia et al.., May 2009; Shayoub *et al* ., 2015]. Therefore the impact of hydrodistillation in comparison to rotatory evaporation will greatly depend on the quantity of compounds to particular extracts (or the same solvent). The impact also varies depending on what one desires to find in the laboratory.

It's possible to deduce that hydrodistillation has its advantages, and disadvantages, over boiling and rotatory evaporation [Prestti *et al.,* 2005; Wang *et al*., 2012]. Boiling is overall the least impactful in terms of the technique since hydrodistillation and rotatory evaporation both involve boiling. Therefore, due to this, hydrodistillation is the second most impactful of the three techniques.

4. WHAT IS THE SIGNIFICANCE OF HYDRODISTILLATION IN TODAYS WORLD?

Hydrodistillation is significant to study the behaviour of cells, microbes and viruses. Therefore it is important in that it allows new information not only on plants, but also about test organisms; in the laboratory, to be found. Hydrodistillation relaxes many inconsistent findings of traditional approaches, and it since has enabled the isolation of new compounds; and the manufacture of derivatives. Furthermore, it is the first step toward quantifying essential oils, some perhaps used in aromatherapy. It is thus a significant procedure, because it has enabled plant organ oils to be tested for different properties, such that important ethnobotanical information can be recorded, and a first step in finding cures to important medical conditions is available [Singh, 2017].

5. CONCLUSION

Hydrodistillation is only one of three modern extraction procedures used. Through the production of hydrodistillates, using a heat and cooling system, it produces compounds needing quantification. Often hydrodistillation is viewed as more qualitative as rotatory evaporation e.t.c., but no such comparison is possible at all levels. Test organism responses to different oils are possible, because of hydrodistillation, however they can by not any means represent the therapeutic essence of a plant. It is agreeable that other extraction tests have greater impact than hydrodistillation.

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