

Small Town Boy in the World of Research through Lemongrass

¹Pratik Pandit Potdar and ²Preetinder Kaur

¹Ph.D. scholar, Department of Processing and Food Engineering, Punjab Agricultural University, Ludhiana.

²Principal scientist, Department of Processing and Food Engineering, Punjab Agricultural University, Ludhiana.

ARTICLE ID: 50

It was the first week of January in the year 2020 when I, a small town boy from Maharashtra, born, brought up, and educated in the same small town arrived in one of the premier institutes in agriculture studies. I secured a good rank in the national level exam to get into the institute. I was nervous, bewildered and flabbergasted walking through the lobbies of the department looking at humongous labs and high-end equipment. I came from a not so recognized university with limited facilities and did not know that so many facilities could exist in order to carry out a variety of research in food engineering. The day arrived when the guide was allotted, all my seniors congratulated me for getting an able guide for my research. My guide asked about my interest for a research topic and I felt overwhelmed and confused by the ideas that popped up in my mind, most of them focused on my state and crops in my state. Various brainstorming sessions followed that opened up my mind and removed the barriers in my mind regarding the field and area of research that can be taken up. After these sessions, we decided to work on the “Optimization of extraction process lemongrass essential oil”. I remember I was sweating profusely and shaking with anxiousness on the day my research topic was decided. I had never worked on any project let alone on the development of any process or equipment. Moreover, I was not aware whether I would be successful, then my counsellor and guide gave me confidence and explained to me the process of research, how to plan research, decide objectives and maneuver the project with trials and more trials.

As they say “Where there’s a will, there’s a way”, a company on the outskirts of Ludhiana approached my guide to suggest potential for processing options and develop protocols for various value-added products of lemongrass. They supported our research by providing us with the lemongrass crop for research trials. My objective was to optimize the

hydro-distillation process using different operating parameters like distillation temperature, distillation time, and sample-to-water ratio. My trials started with chopping of fresh lemongrass into small lengths using the Manual chopping machine 'Toka'. I had to take help of my friend as Lemongrass has a fibrous stem making it difficult to chop. The design of experiment was statistically planned using Design Expert software and the Box Behnken method. The work was going on smoothly but while working we come to the know about pros and cons of the process, Simple hydro-distillation would take about four hours to extract the essential oil. Also, energy consumption used to surge as the system heater used to run for hours, trial after trial. As an engineer, it was our duty to eliminate these barriers, so we came up with the idea of utilizing a Microwave oven for heating instead of a conventional electrical heater in the hydro-distillation unit.

The next challenge was to develop and modify the domestic microwave oven into a setup suitable to use for in the distillation process. A domestic microwave oven was then taken and cut on the upper surface in a round shape so as to pass the distillation setup rod through it. The microwave's control panel was totally redesigned in order to adjust the power levels during the optimization process. In addition, an energy metre was included into the control panel to analyse the system's energy use. With the new microwave system, the distillation unit of glass had to be custom-made according to the dimensions of the microwave. With this newly developed Microwave assisted Hydro-distillation system, the time for essential oil extraction got reduced by 50% and oil yield doubled i.e. 2.5% of sample weight. Additionally, electricity consumption was reduced since there was no requirement of a heater since microwaves would heat up the water and sample mixture instantly. Half of my work was completed, and I was happy that I was on the right track, hoping to wind up my work quickly with the supervision of my guide. However, then came a sudden jolt in my research journey: my guide had to proceed to the U.S.A. for her Post Doctorate Fellowship for 4 months. This was a really tough phase for me to manage my research work; I used to become tense and upset since the driving force of my research project was not there in the department, and my guide was not available. Even though we were thousands of miles away, my guide's continual attention and care kept me motivated and going. Because of the time difference, we used to talk frequently and discuss plans late at night.

Now coming back to research trials, talking again about research the optimization process of Microwave-assisted Hydro-distillation was almost complete, the optimized conditions for maximum oil yield were sample to water ratio 1:8, extraction time 120 min and microwave powerlevel 250 W. We still had some time in our hand to finish the project, then another idea struck our minds. Fresh lemongrass had some moisture content around 70% which becomes bulky to handle and also occupies space in distillation setup as well as consume energy to eliminate the moisture in the crop. Thus, we decided to dry the lemongrass by two different methods prior to the distillation process. We chose hot air drying and microwave drying of lemongrass for 40 minutes and 9 minutes respectively by studying literature to get the final moisture content of around 12% by both methods. Turns out, after drying by either methods, the bulk for handling reduced along with reduced energy consumption as moisture was not there in sample to evaporate. The hot air dried samples gave higher essential oil yield as compared to fresh and microwave fried lemongrass. We also assessed the changes in bio-active compounds in lemongrass dried using both the drying methods. The lemongrass dried using microwave retained more flavonoids, pigments, and ascorbic acid as compared to the hot air-dried samples. Even after conclusion of our research project, lemongrass became an inseparable part of our lives as we came to know its antimicrobial and aromatic properties. We used the extracted essential oil as a room freshener and also used it in further research studies as an anti-microbial element in food packaging films.

This research was published in International Journals and was presented in various conferences.