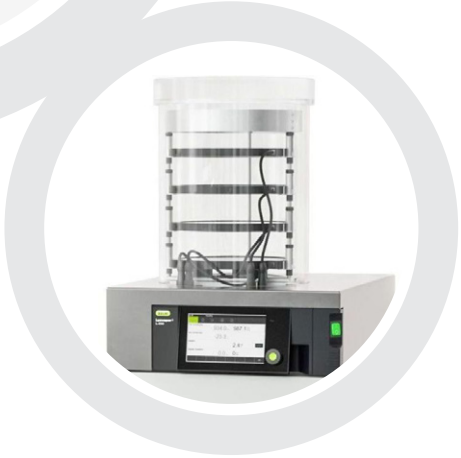
Application Note
No. 422/2021

Lyophilization of Giloy stem

Lyovapor™ L-200 Pro
Freeze-drying of plants



1. Introduction

Giloy, or Tinospora Cordifolia, is an Ayurvedic herb used and endorsed in Indian medicine for a long time. In Sanskrit, Giloy is known as ‘Amrita', which literally translates to ‘the root of immortality’, because of its abundant medicinal properties. In traditional Indian medicine, Giloy is one of the most useful ayurvedic herb. It is used as to

- Boosts immunity
- Treats Chronic fever
- Improves digestion
- Treats Diabetes
- Reduces stress and anxiety
- Reduces Asthmatic Symptoms
- Treats arthritis
- Slow down the tumour growth
- Improves vision
- Reduces signs of age
- Fights Respiratory problems

In this application note, freeze drying is evaluated as a drying method in order to preserve Giloy properties. Freeze drying is known to be one of the most appropriate method for the preservation of natural and biological materials thanks to the lack of liquid water, the oxygen free environment (operated under vacuum or insert condition) and the low operating temperatures. It is a gentle way to remove moisture while obtaining a final product of the highest quality with a retention of the bioactive compounds, texture, colour and oder as well as a reduced weight making transportation easier. Freeze drying can be done using the giloy stem directly or using grinded stem turned into a wet paste. After the freeze drying process, the dry Giloy stem or cake can be grinded into powder form, consumed directly or in a juice.

Even though freeze-drying is known to be a gentle process preserving product properties, some qualities like colour, odour, texture, rehydration property, bulk properties, flow property, water activity and retention of nutrients and volatile compounds can be affected by the drying process. The retention of the bioactive compounds and nutritional qualities are, for example, affected by the oxygen content or too high temperature. Such information should therefore be taken into account when setting up a freeze-drying method. In the case of Giloy, the nutritional qualities may get affected if the temperature goes above 45°C and attention will have to be paid to that parameter when setting up the freeze drying method.

2. Equipment

- BUCHI Lyovapor™ L-200 Pro
- BUCHI Lyovapor™ Software
- Vacuum pump Pfeiffer Duo 6”
- Heated Shelves
- Stainless Steel trays
- Freezer -40°C – Haier

3. Chemicals and Materials

- Giloy Stem
- Stem cutter

4. Procedure

4.1 Sample preparation

600 g of fresh Green Giloy stem was collected from the plant and cut into pieces with an approximate length of 5cm. The stems were cleaned with distilled water and placed on a stainless steel tray. The tray together with the heated shelve was placed in a -40°C freezer and the stems were frozen.

4.2 Lyovapor™ L-200 settings

After overnight deep freezing, the Giloy stem pieces were loaded into the Lyovapor™ L-200 for freeze drying process using the parameters displayed in Table 1

Table 1 : Freeze-drying method used to dry Giloy stems

Step			1	2	3
Phase		Loading	Primary drying	Primary drying	Secondary drying
Duration	hh:mm		06:00	06:00	12:30
Shelf temperature	°C	-25.0	0.0	25.0	40.0
Shelf temperature gradient	°C/min		0.07	0.07	0.02
Pressure	mbar		0.100	0.100	0.100

The shelves were loaded with a temperature of -25°C and their temperature was then increased to zero degree. Primary drying was done in two steps, first with a temperature of 0°C for 6 hours and then with a temperature of 25°C for 6 hours. In order to ensure a low moisture content, a secondary drying phase was set with a temperature of 40°C for 12 hours 30. The shelf temperature during secondary drying should not be set too high since the nutritional properties of the plant could be damaged above 45°C. It was therefore decided to keep the shelf temperature during secondary drying at 40°C to avoid reaching the critical temperature.

5. Result

Figure 1 : Giloy stem before (left) and after (right) freeze-drying

After the freeze drying process, it was observed that Giloy stem were successfully dried. Figure 1 shows that the plant morphology was left untouched by the drying process and 93.5% of the moisture has been removed (Table 2)

Table 2 : Results obtained after freeze-drying Giloy stems.

Description	Weight [g]
Initial weight	600
Final weight	172.58
Giloy weight	161.40
Total % of moisture removed	93.5%

6. Conclusion

Giloy stem were successfully dried using the Lyovapor™ L-200 with a method using both primary and secondary drying. Freeze drying is a highly efficient technique to remove moisture in a gentle manner and is highly suitable to gently dry Giloy stems.
After the drying process, the lyophilized Giloy stem can be converted into powder form using the grinder, can be consumed directly, used in capsules or added in a juice to benefit from the immunity booster properties of the plant.

7. References

[1] https://www.fda.gov/inspections-compliance-enforcement-and-criminal-investigations/warning-letters/emmbros-overseas-lifestyle-pvt-ltd-565631-02052019

[2] https://food.ndtv.com/health/10-amazing-benefits-of-giloy-the-root-of-immortality-1434732#:~:text=%E2%80%9CGiloy%20(Tinospora%20Cordifolia)%20is,of%20its%20abundant%20medicinal%20properties

[3] Mayer, A.M.; Harel, E. Polyphenol oxidases in plants. Phytochemistry 1979, 18, 193–215.

[4] Gibson, L.J. The hierarchical structure and mechanics of plant materials. J. R. Soc. Interface 2012, 9, 2749–2766.

[5] Kulkarni RC, Mandal AB, Munj CP, Dan A, Saxena A, Tyagi PK. Response of coloured broilers to dietary addition of geloi (Tinospora cordifolia) during extreme summer. Indian Journal of Poultry Science. 2011; 46(1):70-74

[6] Bhattacharyya C, Bhattacharyya G. Therapeutic potential of Giloy, Tinospora cordifolia (Wild.) Hook. f. and Thomson (Menispermaceae): The magical herb of ayurveda. International Journal of Pharmac. Biol. Arch. 2013; 4(4):558-584.