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# Determination of sucrose content in *Pycnocycla spinosa* Decne. exBioss root using polarimetry method

G. Asghari[(1)*], S.M. Lajevardi[(2)]

[(1)] *Professor of Pharmaceutical Sciences Research Centre, Isfahan University of Medical Sciences, Isfahan, Iran.*
[(2)] *Ph.D. student of Pharmacognosy, Isfahan University of Medical Sciences, Isfahan, Iran.*

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## ABSTRACT

*Pycnocycla spinosa* plant is of the Apiaceae family which germinates mostly in mountainous areas in Isfahan, Yazd, and Fars provinces. There is a significant amount of sucrose in the roots of this plant. To determine the best time for harvest, from the beginning of the growing season, roots were collected and the sucrose content was measured using polarimetric device. The results showed that the sucrose content of *pycnocycla spinosa* had an increasing trend from the first week of harvest until the tenth week and then decreased back to the seventeenth week level. The lowest rate was recorded in the second week of harvest (5$^{th}$ May) by 8.5% and the highest rate was in the tenth week of harvest (30$^{th}$ June) by 17.0% of root dry weight. Also, the minimum sugar content was 2.6% and the maximum was 5.3% of the roots fresh weight. According to the results, the best time for root harvest was from early July to early August for achieving the maximum rate of sucrose in extraction process from the roots. Considering that the approximate percentage of sucrose in sugarcane stem is between 12-17 and in sugar beet root is between 14-18% of the plant fresh weight and both plants, as major sources of sugar production have their own suitable climate, it seems that if the root of *pycnocycla spinosa* lacks harmful toxic compounds, it can be considered as an ideal crop for sugar production in undesirable land areas. It is suggested that this plant to be studied as a natural source of plant sweetener containing sucrose.

**Keywords**:

## INTRODUCTION

The root of *pycnocycla spinosa* plant which has been grown in the Isfahan University campus (in approximate elevation of 1700-1710 m above sea-level) was collected weekly from the beginning of the growing season (28$^{th}$ April 2009) over 17 weeks. Roots harvested were separated from the shoots. Roots were washed with cold water quickly, crushed and dried at room temperature. Dried roots were powdered and the dried powder was used to measure sucrose (Samulsson 1992).

### *Sucrose extraction*

Ten g of dried root powder was stirred in 100 ml distilled water and incubated for 70 min in a water bath held at 75-80 °C. The sample was stirred for few times during the incubation period and then filtered through Buchner funnel. Sample was washed with 40 ml of warm distilled water again and hence the sucrose of the root was extracted (Shikholeslam 2003).

### *Clarification*

The extract should be made clear and proteins and additional materials be deposited. First, the solution was cooled and 60 ml alkaline lead acetate in 20 $^{o}$C was added and stirred for 90 seconds. Sample was filtered through filter paper. Distilled water was added to the remaining clear solution in a volume of 200 ml and the optical rotation was measured by polarimetric device (Shikholeslam 1997).

*Corresponding author's email: asghari@pharm.mui.ac.ir

**Table 1**. Sucrose percentage in root of *pycnocycla spinosa* measured at different sampling dates

| | Optical rotation | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sampling week*** | **Rep 1** | **Rep 2** | **Rep 3** | **Rep 4** | **Standard deviation** | **Sucrose in dried powder (%)** | **Sucrose in fresh root (%)** |
| 1 | 0.35 | 0.35 | 0.25 | 0.32 | 0.03 | 9.5 | 2.9 |
| 2 | 0.35 | 0.25 | 0.25 | 0.28 | 0.03 | 8.5 | 2.6 |
| 3 | 0.40 | 0.35 | 0.25 | 0.33 | 0.06 | 10.0 | 3.1 |
| 4 | 0.45 | 0.40 | 0.35 | 0.40 | 0.03 | 12.0 | 3.7 |
| 5 | 0.40 | 0.40 | 0.25 | 0.35 | 0.05 | 10.5 | 3.3 |
| 6 | 0.40 | 0.40 | 0.30 | 0.37 | 0.03 | 11.0 | 3.4 |
| 7 | 0.45 | 0.40 | 0.40 | 0.42 | 0.02 | 12.5 | 3.9 |
| 8 | 0.45 | 0.45 | 0.45 | 0.45 | 0 | 13.5 | 4.2 |
| 9 | 0.55 | 0.55 | 0.3 | 0.47 | 0.08 | 14.0 | 4.3 |
| 10 | 0.60 | 0.55 | 0.55 | 0.57 | 0.02 | 17.0 | 5.3 |
| 11 | 0.55 | 0.55 | 0.45 | 0.52 | 0.03 | 15.5 | 4.8 |
| 12 | 0.55 | 0.5 | 0.45 | 0.50 | 0.03 | 15.0 | 4.7 |
| 13 | 0.50 | 0.45 | 0.35 | 0.43 | 0.04 | 13.0 | 4.0 |
| 14 | 0.50 | 0.50 | 0.45 | 0.48 | 0.02 | 14.5 | 4.5 |
| 15 | 0.45 | 0.40 | 0.40 | 0.42 | 0.02 | 12.5 | 3.9 |
| 16 | 0.45 | 0.40 | 0.30 | 0.38 | 0.04 | 11.5 | 3.6 |
| 17 | 0.45 | 0.45 | 0.40 | 0.43 | 0.02 | 13.0 | 4.0 |

Sampling began in 30.10.2009 and continued weekly.

*Measurement of sucrose by polarimetric method*

The Optical rotation of solution derived from each sample was read three times by polarimetric device (ATAGO Polax-zl) at 20 $^{o}$C using 10 cm kot. Sucrose concentration in solution was measured and the percentage of sucrose in dried root powder was determined (Mathlouthi and Reiser 1995).

## RESULTS

Table 1 shows the results of analysis on 17 collected samples. It also illustrates the results of analysis for different replications, sucrose percentage, dried and fresh matter percentage. The rate of sucrose in the dry matter fluctuates between 8.5 to 15.5% and for fresh matter from 2.6 to the maximum of 5.3.

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