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Effect of Light on Degradation of Glaucine During Storage in Organic Solvents

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ABSTRACT

Glaucium flavum Crantz, commonly known as yellow horned poppy, is a biennial herb. This plant is a rich source of glaucine. Glaucine is a photosensitive compound. Glaucine amount was found to decrease with increase in storage durations and decrease was more pronounced in light. The data pertaining to the effect of various storage conditions and storage durations on glaucine solution in chloroform and ethanol reveals that the amount of glaucine decreases with increase in storage duration under both dark and light conditions. The decrease in glaucine amount is highest for 60 days (1.04mg) in glaucine solution in chloroform stored under light conditions and lowest (0.45mg) for glaucine solutions in ethanol stored under dark conditions. Maximum mean degradation of glaucine (10.32%) was recorded in Glaucine solution in chloroform in transparent glass bottles kept in light (S_1) storage condition whereas minimum degradation of glaucine (4.65%) was observed under Glaucine solution in ethanol in glass bottles kept in dark (S_4) storage condition.

Key Words:

Glaucium flavum, chloroform, solvents, storage condition, storage duration

INTRODUCTION

In the modern age, pharmaceutical and chemical sciences have contributed a great deal in uplifting the status of medicinal plants both in developed and developing countries. During the last few decades synthetic drugs, antibiotics, etc., have though come into prominence with the miraculous instantaneous results but many of them have side effects and were found harmful when used for longer periods. Such cumulative derogatory effects are not associated with the plant derived drugs and due to this reason these are considered safer both in poor and affluent countries. There is a vast list of phytopharmaceuticals which are being used as medicines for curing millions of people. Man has remained dependent on various plant

species since long. Plants not only cater to basic needs of man for fuel, fodder and shelter, but some plants are also used for curing various types of diseases. *Glaucium flavum Crantz,* has been used in traditional medicines for its analgesic, sedative, antidiabetic, coloretic and antimicrobial properties (Cabo et. al. 1988). This plant is a rich source of glaucine (an antitussive alkaloid), which is used in cough syrups as a substitute for codeine as it does not inhibit breathing and also does not possess narcotic and habit forming properties (Shreter 1976). All parts of the plant contain glaucine with its content being maximum in leaves and minimum in roots. Glaucine is a very photosensitive compound. It gets degraded in the presence of light. Considering the wide importance of glaucine, it was considered necessary to determine the optimum storage conditions of glaucine to minimize its losses. Hence, present study was conducted to see the effect of light on degradation of glaucine during storage in organic solvents.

MATERIALS AND METHODS

The present study was undertaken in the laboratory of the Department of Forest Products, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni (Solan), Himachal Pradesh. The experimental site is situated 15km from Solan on Solan-Rajgarh road at an altitude of 1200m above mean sea level. It falls in the mid-hill zone of Himachal Pradesh and is located between 30° 51' N latitude and 70° 11' E longitude. The area falls under sub-tropical to sub temperate climate with an average annual rainfall of about 1250 mm. Generally May and June are the hottest months and December to February are the coldest ones. Material used in this study consisted of glaucine, ethanol and chloroform. The experiment was laid out in completely randomized design with 20 treatment combinations (4 storage conditions × 5 storage durations) and three replications for each treatment. 5 mg of glaucine in 2 ml of solvent made one replication. Storage conditions and storage durations used in this experiment are given below:-

Treatments

(a) Storage condition (s) : 4

(i) Glaucine solution in chloroform in transparent glass bottles kept in light. (S_1)
(ii) Glaucine solution in chloroform in glass bottles kept in dark (S_2).
(iii) Glaucine solution if ethanol in transparent glass bottles kept in light (S_3).
(iv) Glaucine solution in ethanol in glass bottles kept in dark (S_4).

b) Storage durations (T) : 5

(i) 0 days (T_1)
(ii) 15 days (T_2)
(iii 30 days (T_3)
(iv) 45 days (T_4)
(v) 60 days (T_5)

Solvent from the samples was evaporated and their amounts of glaucine (mg) were estimated by using colorimetric method (Stefanov 1972) and are expressed in percentage on dry weight basis. Decrease in glaucine (mg) of each sample was calculated on the basis of amount of glaucine (mg) in pure sample (stored for zero day). Degradation of glaucine (%) was calculated by using following formula:

$$\text{Degradation of glaucine} = \frac{\text{Decrease in glaucine amount in the sample}}{\text{Amount of glaucine in pure sample (stored for 0 day)}} \times 100$$

The data for this study was subjected to analysis under Factorial CRD in the computerized statistical package SX. Various treatments and their interactions were tested for their significance at appropriate degree of freedom and at 5 percent level of significance as described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The data pertaining to effect of various storage conditions and storage durations on stability of glaucine in different solvents is presented in Table 1.

The amount of glaucine was observed to decrease with increase in storage durations under all storage conditions (S_1: Glaucine solution in chloroform kept in light; S_2: Glaucine solution in chloroform kept in dark; S_3: Glaucine solution in ethanol kept in light; S_4: Glaucine in ethanol kept in dark). Besides 5mg of glaucine estimated for 0 day storage duration under all storage conditions, the maximum amount of glaucine (4.87 mg)) was recorded when the glaucine was stored under S_4 condition for 15 days duration which was however, found statistically at par with amount of glaucine estimated under S_1 (4.75 mg), S_2 (4.83 mg) and S_3 (4.79 mg) for 15 days of storage and under S_4 (4.75 mg) for 30 days of storage. Minimum amount of glaucine (3.96 mg) was estimated under S_1 condition for 60 days of storage duration. Maximum value of mean glaucine (4.77 mg) was estimated when glaucine was stored under S_4 condition which was, however, found at par with amount of glaucine estimated (4.73 mg) under S_2 storage condition. Minimum value of mean glaucine amount (4.48 mg) was found under S_1 storage condition and maximum mean glaucine amount (4.81 mg) was recorded when glaucine was stored for 15 days. Minimum mean glaucine amount (4.28 mg) was recorded, when glaucine was stored for 60 days.

Glaucine amount was found to decrease with increase in storage durations and decrease was more pronounced in light. However trend was not observed to be much influenced by choice of solvent either chloroform or ethanol. This was confirmed by calculating variations in glaucine degradation (%) with storage conditions in different solvents (Table 2). Maximum loss of glaucine (in comparison to the amount of glaucine at 0 day duration under each storage condition) was recorded as 20.87 percent under S_1 storage condition for 60 days duration which was, however, found at par with loss of glaucine (17.40%) under S_3 condition for 60 days duration. Minimum loss of glaucine (2.60%) was recorded under S_4 condition for 15 days duration and was statistically at par with loss of glaucine under S_2 and S_3 condition for 15 days storage duration. Maximum mean degradation of glaucine (10.32%) was recorded under S_1 storage condition. Minimum degradation of glaucine (4.65%) was observed under S_4 storage condition which was found statistically at par with degradation of glaucine (5.47%) under S_2 storage condition.

Table 1. Effect of light and storage durations on stability of glacuine in different solvents.

Storage conditions	Storage durations (days)					
	0	15	30	45	60	Mean for Storage conditions
Glaucine solution in chloroform kept in light (S_1)	5.00	4.75	4.46	4.25	3.96	4.48
Glaucine solution in chloroform kept in dark (S_2)	5.00	4.83	4.71	4.63	4.46	4.73
Glaucine solution in ethanol kept in light (S_3)	5.00	4.79	4.55	4.33	4.13	4.56
Glaucine solution in ethanole kept in dark (S_4)	5.00	4.87	4.75	4.67	4.55	4.77
Mean for storage durations	5.00	4.81	4.62	4.47	4.28	
CD at 5%	Storage Conditions		Storage durations		Storage conditions × Storage durations	
	0.059		0.067		0.133	

*Values in the table are the amounts of glaucine (mg).

Table 2. Variations in glaucine degradation (%) with storage durations and light in different solvents

Storage conditions	Storage durations (days)					
	0	15	30	45	60	Mean for Storage conditions
Glaucine solution in chloroform kept in light (S_1)	0.00 (0.71)*	5.00 (2.35)	10.73 (3.33)	15.00 (3.94)	20.87 (4.62)	10.32 (2.99)
Glaucine solution in chloroform kept in dark (S_2)	0.00 (0.71)	3.40 (1.96)	5.00 (2.50)	7.40 (2.81)	10.73 (3.33)	5.47 (2.26)
Glaucine solution in ethanol kept in light (S_3)	0.00 (0.71)	4.20 (2.15)	9.07 (3.07)	13.27 (3.71)	17.40 (4.23)	8.79 (2.77)
Glaucine solution in ethanole kept in dark (S_4)	0.00 (0.71)	2.60 (1.76)	5.00 (2.35)	6.60 (2.66)	9.07 (3.07)	4.65 (2.11)
Mean for storage durations	0.00 (0.71)	3.80 (2.05)	7.65 (2.81)	10.57 (3.28)	14.52 (3.81)	
CD at 5%	Storage Conditions		Storage durations		Storage conditions × Storage durations	
	0.190		0.021		0.426	

*Values within parenthesis indicate transformed values.

The data pertaining to the effect of various storage conditions and storage durations on glaucine solution in chloroform and ethanol (Tabl- 1) reveals that the amount of glaucine decreases with increase in storage duration under both dark and light conditions. The decrease in glaucine amount is highest for 60 days (1.04 mg) in glaucine solution in chloroform stored under light conditions and lowest (0.23mg) for glaucine solutions in ethanol stored under dark conditions.

Degradation of glaucine is more pronounced for storage under light conditions (20.87% in chloroform and 17.40% in ethanol) than under dark conditions (10.73% in chloroform and 9.07% in ethanol) for 60 days storage duration. However, trend does not seem to be much influenced by choice of solvents. Results also indicate that glaucine solutions in both ethanol and chloroform are unstable even under dark conditions. The chloroform and ethanol solutions of glaucine are rather unstable in presence of air. After 1 - 2 days, in the glaucine solution in ethanol, Chervenkova et al. (1981) detected the presence of 7, 6 – dehydro glaucine, glaucine-N- oxide, 1, 2, 9, 10-tetramethoxy oxoaporphine and corunine, however, U.V. irradiation for 2 hours yielded dihydropontevedrine and pontevedrine in addition to above mentioned compounds.

CONCLUSIONS

Glaucine degradation increased with increase in storage durations under all storage conditions. Solution of glaucine in chloroform kept in light showed maximum degradation of glaucine whereas glaucine solution in ethanol kept in dark showed minimum degradation. Glaucine forms unstable solutions both in chloroform and ethanol.

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