

The Effect of Fermentation on the Diosgenin Content of *Dioscorea* Tubers

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INTRODUCTION

Diosgenin is the material employed for the preparation of several widely used pharmaceutical products. It can be isolated readily from several species of *Dioscorea* tubers. This steroid is the basis of an industry that each year fabricates products valued at more than \$50,000,000. The wild, high-yielding tubers of commerce are native to Mexico and Central America, and have not yet been domesticated. Other high-yielding species of wild tubers are native to Africa. The domestication program here in Puerto Rico has been in progress for several years. The outlook is very promising.

PROCEDURES AND RESULTS

All of the commercial producers of diosgenin use essentially the same process for its isolation from wild *Dioscorea* tubers. This consists of three operations: 1, Maceration and fermentation of the tubers; 2, acid hydrolysis of the fermented mixture; 3, extraction of the diosgenin with petroleum ether.

The fermentation step has been an important part of the standard isolation procedure for almost 20 years. Its use is based on the belief that fermentation increases the amount of diosgenin that can be isolated from the tubers. This paper describes a study of the fermentation procedure, and presents data which illustrate for the first time the true effects of fermentation on diosgenin content.

Fresh tubers, 2 years old and weighing 30 pounds, were sliced, divided into three equal portions, and then homogenized with an equal weight of water in a high-speed blender for 5 minutes. The macerated tubers were then placed in 10-gallon porcelain pots. The total weight, the percentage moisture, and the total diosgenin were recorded for each pot. The pots were then stored for 7 days at 30° C. in a dark room. At the end of 7 days the contents of one pot were weighed and analyzed⁴. After fermenting for 2 weeks the contents of the second pot were analyzed, and the contents of the third jar

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⁴ Rothrock, J. W., Hammes, P. A., and McAleer, W. J., *Ind. Eng. Chem.*, **49**, 186-88, 1957.

were analyzed after fermenting for 3 weeks. This experiment was repeated three times with both *Dioscorea composita* and *D. floribunda*. The results of all experiments were for all practical purposes the same. Typical data are presented in table 1.

TABLE 1.—*Fresh weight, dry weight, and diosgenin contents (grams) of 2 species of Dioscorea after various treatments*

Treatment of fresh tuber before analysis	<i>D. composita</i>			<i>D. floribunda</i>		
	Fresh weight	Dry weight	Total diosgenin	Fresh weight	Dry weight	Total diosgenin
1, Sliced, dried, and ground	600	197.6	5.2	600	200.0	5.5
2, Homogenized, dried, and ground	600	200.0	8.4	600	204.0	8.9
3, Homogenized and fermented 7 days	600	183.6	8.2	600	198.3	8.9
4, Homogenized and fermented 14 days	600	182.5	8.3	600	174.7	8.5
5, Homogenized and fermented 21 days	600	180.4	7.6	600	173.4	8.0
6, Homogenized and fermented 28 days	600	175.5	7.0	600	149.3	7.6

DISCUSSION

The data show that the total weight of diosgenin in the fresh tubers is not changed by fermentation periods extending up to 21 days. It will be noted that the percentage of diosgenin apparently increases during fermentation. It is obvious, however, that this increase does not reflect a change in the quantity of diosgenin present, but rather indicates a decrease in the dry weight of total solids. The data show that fermentation does not increase the weight of diosgenin present in *Dioscorea* tubers.

SUMMARY

The total weight of diosgenin in fresh *Dioscorea* tubers remains unchanged during fermentation periods of up to 21 days, but the percentage of diosgenin seemingly increases. This apparent increase is attributed to a decrease in the dry weight of total solids present only.

RESUMEN

Los datos experimentales muestran que el peso total de diosgenina en los tubérculos frescos de *Dioscorea* no cambia durante el período de fermentación. Se nota que el porcentaje de diosgenina aumenta durante la fermentación. Por otra parte, este aumento no depende de un cambio de la cantidad de diosgenina presente, sino del peso seco de los sólidos totales, el cual disminuye. Por consiguiente, los datos experimentales muestran que la fermentación no aumenta el peso de diosgenina presente en los tubérculos de *Dioscorea*.