

## PENETRATION ABILITY OF FLAVONOIDS ПРОНИКАЮЩАЯ СПОСОБНОСТЬ ФЛАВОНОИДОВ

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**Резюме.** В статье представлены результаты определения проникающей способности флавоноидов тысячелистника травы, полученные с использованием смеси растворителей (20% пропанола-2, 30% диметилсульфоксида и 50% воды). Через 24 часа проникновение флавоноидов при комнатной температуре в желатиновый гель составило 4 мм.

**Ключевые слова:** Флавоноиды, проникающая способность, *Achillea millefolium*.

**Abstract.** The article presents the results of yarrow herb flavonoids penetrating ability determining obtained using a mixture of solvents (20% propanol-2, 30% dimethylsulfoxide and 50% water). After 24 hours, the penetration of flavonoids at room temperature into the gelatinous gel was 4 mm.

**Keywords:** Flavonoids, penetrating ability, *Achillea millefolium*.

### Introduction

*Achillea millefolium* has a wide spectrum of pharmacological activity, a number of which are due to the presence of flavonoids, among which the 7-O-glucosides of apigenin and luteolin are dominant.

Previously, no studies have been carried out on the penetrating ability of flavonoids of the yarrow herb, the results obtained may be useful in the initial stages of the development of external dosage forms.

### Materials and methods

To extract flavonoids, weighed portions of 0.05 g of yarrow herb, previously ground and sifted through a sieve with apertures of 180  $\mu\text{m}$  [1]. For work, we took a fraction that passed through a sieve. Solvents were used for extraction: 80% methanol and an extraction mixture consisting of 20% propanol-2, 30% dimethylsulfoxide (DMSO) and 50% water in an amount of 5.00 ml [1, 2]. Extraction was carried out in a water bath for 60 min at 80 °C in tightly sealed vials with a screw cap [3, 4]. After extraction, the obtained extract was filtered, the resulting filtrate was used for further work.

5% gelatin prepared according to the following procedure was used as a model for studying the penetration ability. A 5.0 g sample of dry gelatin was weighed, 60.0 ml of cold water was poured and left to swell for 30 minutes. Then 40.0 ml of cold water was added and the mixture was placed in a water bath at 70 °C and dissolved with stirring until a clear solution was obtained. Then the resulting solution was poured into test tubes and placed in a refrigerator until solidified [4].

The resulting gelatin was used to study the penetrating ability based on the occurrence of a chemical reaction between flavonoids and a 2% aqueous solution of aluminum chloride, the result of which is the formation of a colored

complex. 0.100 ml of extract, 0.080 ml of 2% aqueous solution of aluminum chloride, 0.020 ml of acetic acid and 0.800 ml of purified water were placed on the surface of the gelatin. The degree of penetration of flavonoids was recorded in UV light every 1 hour and a half during the day at room temperature [4].

A 5% gelatin was also prepared with the addition of basic lead acetate. A 5.0 g weighed portion of dry gelatin was weighed, 60.0 ml of cold water was poured into it and left to swell for 30 min. Then 1.0 basic lead acetate was weighed, dissolved in 40.0 ml of water, the resulting solution was added to the swollen gelatin, and the resulting mixture was placed in a water bath at 70 °C and dissolved with stirring. Then the resulting solution was poured into test tubes and placed in a refrigerator until solidified [4].

Gelatin with the addition of lead acetate was used to study the penetration ability based on the formation of a bright yellow colored compound when this reagent interacts with flavonoids. On the surface of the solidified gelatin with lead acetate, 1.00 ml of the extract was placed and the degree of penetration in visible light was recorded every hour and a half during the day at room temperature [4].

### Results and discussions

As a result of the experiment, the following data were obtained.

The penetration rate of flavonoids obtained by extraction with a mixture of solvents after 24 h using a 2% aqueous solution of aluminum chloride, as well as a model with the addition of  $\text{Pb}(\text{CH}_3\text{COO})_2$ , was 4.0 mm.

Comparing the results obtained with the data obtained in the previous experiment [4], we can say that the flavonoids contained in the extracts obtained using the extractant, which contains DMSO, have a higher penetrating ability.

**Table 1.** Penetration ability of flavonoids isolated when using a mixture of solvents as an extractant

Fixation time	Gelatin with $Pb(CH_3COO)_2$	Gelatin followed by the addition of extract to it and $AlCl_3$
9:12	0,5	0,5
10:42	0,5	1
12:11	1,5	1,5
14:18	2	2,5
16:25	3,5	3,5
18:36	3,5	3,5
in 24 hours	4	4

### Conclusions

The flavonoids, which are part of the extracts obtained on the basis of the extractant, which includes DMSO, have the highest penetrating ability.

### References

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