

ELAEAGNUS ANGUSTIFOLIA L. FLOWER SOFT EXTRACT VALORIFICATION IN A DERMATOLOGICAL PREPARATION

NOTE 2. DERMATOLOGICAL PREPARATION RHEOLOGIC CONTROL

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Abstract

In order to determine the stretch capacity (the plastic feature) and the viscosity for five dermatological preparations (P₁-P₅) with *Elaeagnus angustifolia* L. flower soft extract incorporated in different ointment bases (B₁-B₅), an assessment of the rheologic properties (spread capacity and tixotrop properties) for these preparations has been carried out. Of all the tested products only P₃ dermatologic preparation fits all pursued criteria, according to Romanian Pharmacopoeia Xth Ed. and European Pharmacopoeia, therefore B₃ ointment base is the most adequate for obtaining a suitable dermatologic preparation.

Rezumat

S-a urmărit evaluarea proprietăților reologice (capacitatea de etalare și proprietățile tixotrope) pentru cunoașterea capacității de întindere (caracterul plastic) și a vâscozității, a cinci produse dermatologice (P₁ – P₅) conținând extract moale obținut din flori de *Elaeagnus angustifolia* L. încorporat în diferite baze de unguent (B₁ – B₅). Dintre toate produsele examinate doar produsul P₃ corespunde cerințelor Farmacopeei Române ediția a X-a și Farmacopeei Europene, deci baza de unguent B₃ este cea adecvată pentru obținerea produsului dermatologic.

Key words: *Elaeagnus angustifolia* L. flower soft extract, dermatological preparation, rheological properties.

Introduction

In Note 1 [1] we dealt with obtaining a dermatological preparation and its preliminary quality control by following organoleptic properties, aspect, homogeneity and pH. However, the dermatologic preparations must have, beside these features, some cosmetic properties which make them pleasant for patients. Those properties allow an easy application, a comforting sensation on the skin and a pleasant aspect after application. For these reasons, rheological properties are very important for dermatologic preparations, because an easy application depends on their viscosity and on

their plastic features. A solid preparation is difficult to apply mostly on irritated or wounded skin [2].

Materials and methods

The *Elaeagnus angustifolia* L. flowers soft extract (obtaining in accordance with FR X) was incorporated in washable ointment bases (B₁, B₂, B₃) in 6% concentration, obtaining the preparation P₁, P₂, P₃, in carbopol gel 1% (B₄) in 3% concentration, obtaining the preparation P₄ and in simple ointment (B₅) in 6% concentration, obtaining the preparation P₅ [1].

- B₁ - emulgator ointment officinal in the Romanian Pharmacopoeia X-th Edition with the following formula: emulgator cetyl-stearyl alcohol 30g, liquid paraffin 35g, salve 35g
- B₂ - emulgator ointment hydrated with 60% water
- B₃ - anionic base (emulsion ointment O/W type) with the following formula: natrium laurilsulfat 1 g, cetyl-stearyl alcohol 15 g, glycerin 15 g, nypagin 0,1 g and water 68,9 g
- B₄ - from gels group, carbopol gel 1% with the following formula: carbopol 940 1 g, glycerin 3 g, natrium hydroxide solution 10% 3 g, preservative solution 93 g; although it has a small blending capacity (until 2%) this gel may develop this property if added 10% per emulgators
- B₅ - from suction ointments group, simple ointment, officinal in the Romanian Pharmacopoeia X-th Edition, with the following formula: lanoline 10 g, salve 90 g, with high capacity of blending water or aqueous solution.

For the control of the rheological properties the spread capacity (through extensiometric curves) and the viscosity (through rheological curves) have been determined.

Only the dermatological preparations obtained with washable bases (P₁, P₂, P₃) and that of hydrogel type (P₄) have been studied. The P₅ dermatological preparation was eliminated because of its undue consistency.

Spread capacity determination: it was performed with extensimeter apparatus (after P. Ojeda and S. Arbussa). The apparatus consists of two square glass plates, 11 cm on each side. On the outside part of the inferior plate a coordinate paper is attached, on which five concentric circles with perpendicular diameter in millimeters are drawn [3].

Based on the calculated surfaces, the extensiometric curves were plotted. On Y-coordinate the ointment surfaces, in mm² were marked and on X-coordinate the loadings value, in grams (g) were marked.

In order to observe the possible modifications of the spread capacity during the ointments conservation, the determinations were performed just after preparation and 45 days after preparation.

Viscosity determination was performed with rotatory viscometer RHEOTEC apparatus, RC 1 type.

The ointments are non-newtonian bodies, so their viscosity is modified, both according to the temperature and to the shearing force applied at fixed temperature [2, 4, 5].

The principle used is based on the viscous braking which a body creates when rotating in a fluid whose viscosity is being determined.

The measuring device is made of two concentric rollers, the exterior roller is fixed and the interior one is mobile. The ointment is placed on the measuring room, between the fixed cup and the rotary element (the ointment is placed in the outer fixed roller, in which is plunged the inner mobile roller).

The shearing speed (D [1/s]) is set gradually every 10 units from 10 to 200.

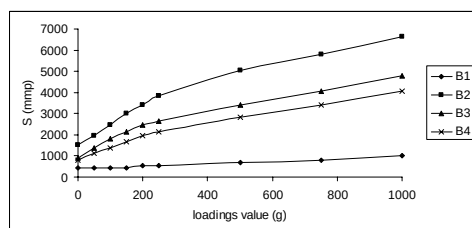
The determinations were performed at room temperature, at 1 minute intervals, from low to high speed. For initial determinations, CC48 cup for P_2 , P_3 , P_4 dermatological preparations (with semisolid consistency) and CC14 for P_1 dermatological preparation (with solid consistency) were used. For the determinations made 45 days after preparation CC48 cup for P_3 , P_4 dermatological preparations (with semisolid consistency), CC25 cup for P_2 dermatological preparations (with semisolid-solid consistency) and CC14 for P_1 dermatological preparation (with solid consistency) were used.

The dynamic viscosity variation depending on shearing force was plotted as flow curves (rheograms), two-dimensional diagrams, XOY, having plotted the dynamic viscosity τ (eta [Pa*s]) on the X-coordinate and the shearing force η (tau [Pa]) on the Y-coordinate.

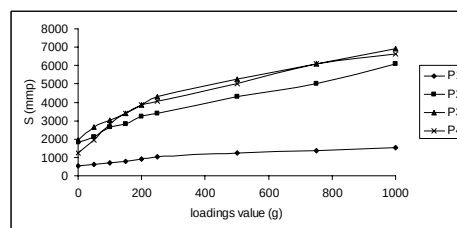
Results and discussion

Since the dermatological preparation in fatty base (P_5) has an undue consistency, on the rheological properties evaluation, only the preparations in washable bases (P_1 , P_2 , P_3) and that of hydrogel type (P_4) were studied.

The values obtained as a result of the spread capacity determination for the dermatological preparations and the bases used at their preparation through comparison, are plotted on extensiometric curves in figures 1 and 2.

**Figure 1**

The extensiometric curves for selected ointment bases

**Figure 2**

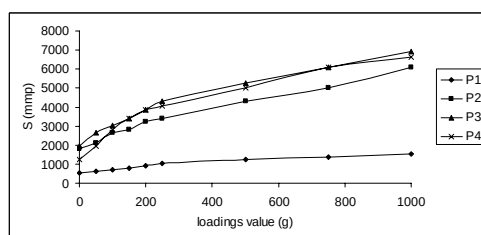
The extensiometric curves for dermatological preparations just after preparation

The curves show that although the spread capacity for ointment base B₂ is the best, after the soft extract was incorporated and the product became P₂ dermatological preparation, its plastic features decreased.

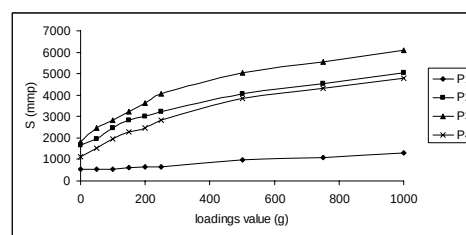
On the other hand, the ointment base B₃ improves its spread capacity after soft extract incorporation, so that the P₃ dermatological preparation has the best spread capacity, but nearly equal to that of P₄ dermatological preparation.

Because in P₄ dermatological preparation the soft extract concentration is only 3% (the ointment base B₄ liquefies at high concentration), we estimate that P₃ dermatological preparation is the one which has both the spread capacity and the soft extract concentration pursued.

The determination results made on the dermatological preparations just after preparation and 45 days after preparation are plotted on the extensiometric curves in figures 3 and 4.

**Figure 3**

The extensiometric curves for dermatological preparations just after preparation

**Figure 4**

The extensiometric curves for dermatological preparations after 45 days from preparation

The extensiometric curves show that 45 days after preparation, P₃ dermatological preparation is the one which best conserves the spread capacity.

The dynamic viscosity variation depending on shearing force for the determination made just after preparation, 45 days after preparation was plotted in two-dimensional rheograms for each dermatological preparation (fig. 5- 8).

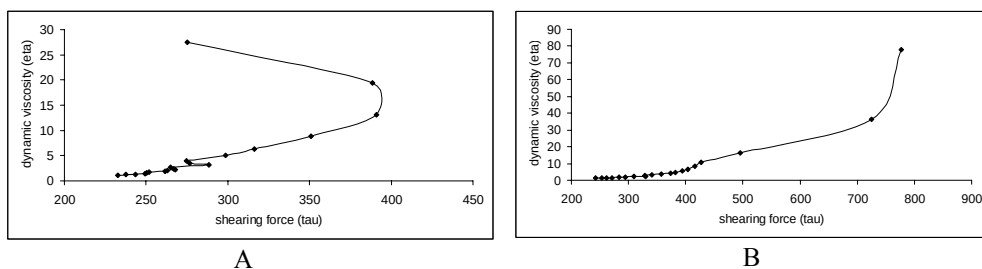


Figure 5
Dermatological preparation P₁ rheograma
A – just after preparation; B – 45 days after preparation

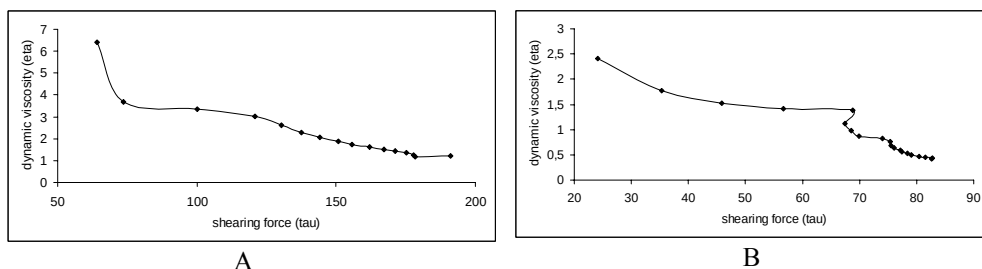


Figure 6
Dermatological preparation P₂ rheograma
A – just after preparation; B – 45 days after preparation

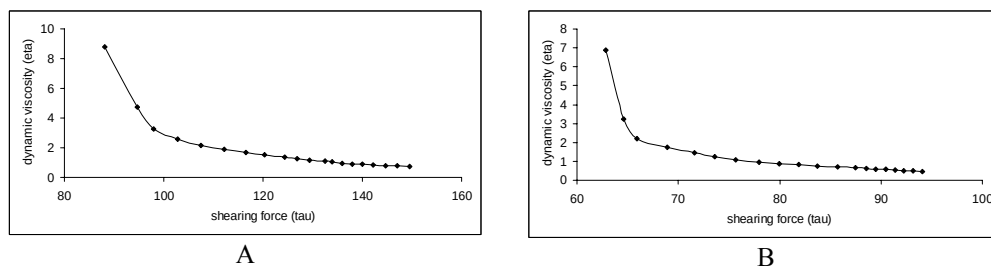


Figure 7
Dermatological preparation P₃ rheograma
A – just after preparation; B – 45 days after preparation

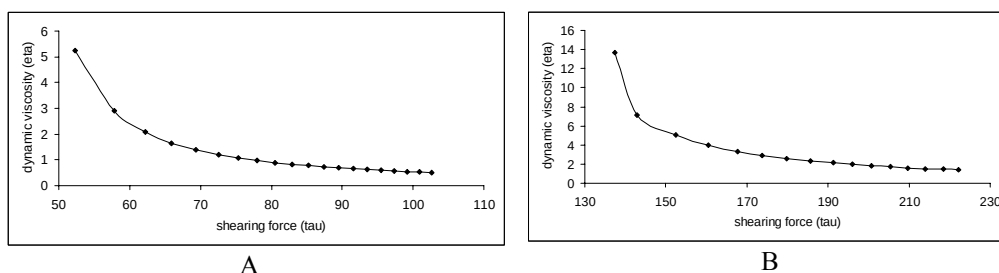


Figure 8
Dermatological preparation P₄ rheograma
A – just after preparation; B – 45 days after preparation

The dermatological preparation P₁ rheograma (fig. 5) shows that this one is an inappropriate product because it has a newtonian flow, different from the ointments which have non-newtonian flow.

Dermatological preparation P₂ behaves like a preparation with pseudo-plastic properties, but the flow is not uniform (fig. 6).

The rheograms of the P₃ preparation (fig. 7) and the P₄ preparation (fig. 8) show a uniform flow, characteristic for semisolid preparations.

Conclusions

Based on the results obtained on the P₁-P₅ dermatological preparations rheological properties control we discovered that only P₃ dermatological preparation meet all the criteria (6% soft extract concentration, appropriate spread capacity and tixotrop properties).

In conclusion, the ointment base B₃ is the most appropriate for obtaining a dermatological preparation with *Elaeagnus angustifolia* L. flower soft extract.

The use of *Elaeagnus angustifolia* L. flower soft extracts in cosmetics industry may become a new research subject, due to the fact that vegetal extracts and vegetal fats are the basis of some nowadays scientific research [6, 7].

References

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