EVALUATION OF EFFECTS ON SKIN PARAMETERS OF ORAL TREATMENT WITH FRESH PRESSED NETTLE JUICE AND FRESH PRESSED DANDELION JUICE- AN OPEN, CONTROLLED, PROSPECTIVE PILOT STUDY

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Key words: Skin elasticity, skin hydration.

Summary

We conducted observation trials on the effects of treatment with a combination of fresh pressed nettle and dandelion juices on objective and subjective skin condition parameters. 10 healthy female test participants (test group) took orally the combined plant juices over a period of 6 weeks, while at the same time receiving a standardised skin care using basic DAC cream. A further group of ten female participants (control group) were merely given the standardised basic DAC cream. Measurements were taken at precisely defined skin areas on face and left forearm before the start of the trials and after 1,2,4 and 6 weeks to find out what effects the fresh pressed plant juices had on the skin using pH-Metry, corneometry, cutometry and profilometry. All participants were asked about a series of subjective parameters at the same intervals.

Skin hydration parameters showed a clear improvement in the test group on both face and forearm after 4 weeks of juice intake. After 6 weeks there was a significant difference in comparison with the control group (p=0.05). Elasticity of skin increased significantly or at least improved clearly. pH-Metry and profilometry measurements showed no changes due to plant juice intake. Level of satisfaction with skin condition revealed in questionnaires filled in by participants improved slightly after just one week in comparison to the control group. This tendency increased after 4 and especially after 6 weeks into a clear difference versus the control group, who reported no overall change in their skin condition.

This pilot study implies beneficial effects of stinging nettle and dandelion fresh pressed juices on skin parameters.

Riassunto

Sono stati presi in considerazione gli effetti provocati dall’assunzione orale di un succo di ortica e tarassaco utilizzando parametri obiettivi e soggettivi.

Sono stati sottoposte a controllo dieci persone di sesso femminile che hanno preso per via orale una bevanda composta dai due succhi, unitamente ad un trattamento topico denominato DAC per un pe-
periodo di sei settimane.
Un gruppo di dieci donne che applicavano solo la crema DAC sono state utilizzate come controllo. Alla I, II, IV, e VI settimana è stato effettuato il controllo sulle aree prescelte del viso e dell'avambraccio mediante la misurazione del pH, dell'idratazione cutanea, dell'elasticità cutanea e della profilometria.
Sia l'idratazione che l'elasticità cutanea hanno dimostrato un netto e significativo miglioramento (p=0.05) fin dalla quarta settimana sul gruppo che prendeva per bocca il succo in paragone al gruppo di controllo.
Il pH e la profilometria non hanno mostrato differenze significative.
Alla sesta settimana, la significatività è risultata maggiore anche con i controlli soggettivi.
Questo studio pilota ha dimostrato che, con i parametri utilizzati, il succo di ortica e di tarassaco sono in grado di esercitare effetti benefici sulla cute.
INTRODUCTION

Treatment with nettle and dandelion fresh plant juices is restricted at present to the following indications:
Nettle for flushing-out therapy of kidneys and bladder, and prevention and treatment of kidney stone, supporting treatment of rheumatic disorders and support in slimming diets.
Dandelion is recommended for gall-flow problems, improves diuresis and also digestive disorders.
Increasingly it has been observed that drinking these juices leads to an improvement in skin condition. As a result of these interesting side-effects, these trials were carried out on 20 female trial participants with healthy skin.
Parameters for assessment of skin condition include pH-metry \([1]\), corneometry \([1,2,5]\), cutometry \([1,2]\) and profilometry \([1,3,4,5,7]\). These measurement methods and especially the roughness measurement of the skin have now become important parameters in dermatology and cosmetology \([4]\), especially in assessing results of treatment with cosmetic products \([1]\).

PROCEDURE

The assessment of skin condition or changes to it through nettle and dandelion plant juices was investigated on healthy, female test participants both using questionnaires and the following measurement methods: pH-metry, corneometry, cutometry and profilometry. The trials lasted six weeks. Four days prior to the start of the trials all the participants began using a standardised care of facial and forearm skin with basic DAC skin cream. This was continued throughout the trials. After initial measurements (week 0), ten of the participants (test group) received 12 bottles each of nettle and dandelion plant juice. All participants were asked after 1, 2, 4 and 6 weeks about various subjective parameters and unwanted effects, and parallel to this the skin function tests described above were carried out. Each time, the measurements were carried out at exactly defined places on the skin on face and left forearm.

TEST PARTICIPANTS

20 healthy female participants (aged \(\geq 30\) and \(\leq 50\) years) were examined. In the test group the average age was 44.4 (34-49 years) and in the control group 37.2 (30-45 years).
From 20 participants, ten in the test group were given plant juices and ten in the control group were not. Seven of the 20 participants reported that they regularly smoked, of which 5 were in the test group and two in the control group.

MATERIAL

The test preparations used were fresh pressed plant juices nettle and dandelion from the Walther Schoenenberger Company (Magstadt, Germany). For the standard skin care on face and forearm, the participants used basic DAC cream (no active ingredients).

METHODS

The investigation was based on observations, whereby the participants were checked on the one hand by means of questionnaires and on the other using hand measurement techniques described below at time intervals 0, 1, 2, 4 and 6 weeks.

QUESTIONNAIRE

At each interval participants were asked extensively about any unwanted results, subjective symptoms (such as newly occurring stinging, itching, skin tension, peeling, reddening and dryness) and about general skin condition. Furthermore, each objective symptom was documented by the trial doctor. The questionnaires were fil-
Evaluafion of effects on skin parameters of oral treatment with fresh pressed nettle juice and fresh pressed
led out at intervals 0, 1,2,3,4 and six weeks. Week 0 represented the initial condition, subsequent documentation logged improvement or any newly occurring symptoms. The grading was divided into four categories.

**PH-METRY**

Measurement technique: for measuring the pH value of the skin PH900 * (Courage and Khazaka Electronics, Ltd, Cologne, Germany) was used, which uses a potentiometric measurement method. The equipment consists of a base unit plus a mobile glass electrode. This electrode registers potential changes or potential differences, which are then shown in a built-in voltmeter and pH value [1].

**CORNEOMETRY**

Measurement technique: The measurement series were carried out with the Corneometer CM 825 * (Courage and Khazaka Electronics, Ltd, Cologne, Germany) [5]. It is a capacitative measurement system with which it is possible to measure the water content of the stratum corneum to a depth of 30-40 microns. The measurement principle is based on measuring electrical capacity. Water possesses a high dielectric constant (81) [1,5]. Any change in the dielectric constants due to water content in the stratum corneum leads to a change in the electric capacity of the condensator. The condensator is located in a small measuring probe.

**CUTOMETRY**

Measurement technique: Using the Cutometer SEM 575 * (Courage and Khazaka Electronics, Ltd, Cologne, Germany) the elastic and plastic (viscous) elements of the skin are measured [1,2]. The cutometer works on a vacuum suction principle. The measurement probe is applied to the skin with constant pressure (450 mbar) on the skin area to be measured which is having suction applied to it via a 2 mm opening using a partial vacuum. The intake time lasts 5 sec. (on-time) followed by a 3 sec release interval (off-time). This procedure is repeated three times and the average value of the elasticity parameter calculated.

**PROFILOMETRY**

Measurement technique: Skin roughness measurement is done using a computer supported transmission profilometry with the Skin Visiometer SV 500* (Courage and Khazaka Electronics, Ltd, Cologne, Germany).

A surface relief of the skin is first produced using a silicone impression (see below). This is then irradiated using parallel light. The transmitted light is measured with the help of a CCD camera and digitally processed [4,5,7]. The transmission profilometer calculates the thickness of the prepared silicon impression via the absorption of the light let through, using the Lambert-Beer'schen Law. Using the screen, the surface relief of the skin can be scaled through 256 shades of grey, so that the skin roughness or the fold relief of participants can be documented. A special software enabled us to project 180 circular profile lines onto the surface relief of the skin, thus enabling the calculation of the roughness parameters Rr, Rz, Rm, Rp and Ra (corresponding to DIN norms).

Silicone impressions: It is important for good measurement results to be able to make clean, reproducible silicon impressions. The impressions should be as thin as possible and without air bubbles. A foil with a hole in the middle is applied to an exactly defined spot on the skin. Two low-viscosity silicon components at the ratio of 1:1 with a vacuum pump mixed with each other thoroughly for 15-20 seconds then applied quickly in the middle of the foil (one drop =ca 0.5 ml), a plaster applied and allowed to harden for approx. 3-5 minutes. Then the foil
can be carefully removed and fixed in a carrier-frame, inserted into a special instrument including a light source on one side and a black and white video sensor CCD camera with especially high resolution of 752 x 582 pixels on the other [1].

STATISTICS

To test for significant variation the Wilcoxon Test was used as a non-parametric procedure for two samples. In case of variation within the test group the Wilcoxon Test for pair differences was used. For the selected statistical model the error level was set a 0.05. Because of the small sample size the presentation of the test results was done using descriptive statistics. To find the mean value of the ordinal scale values it was assumed that the test participants find the intervals between the categories scaleable: thus a quasi-metric data level was assumed.

RESULTS

Evaluation of the questionnaires

At the beginning of the trial period (week 0) we established by means of a questionnaire the subjective parameters plus participants' satisfaction with their skin (illustration 1). Then, at intervals week 1, 2, 4 and 6 the participants were asked about parameters such as newly occurring stinging, itching, skin tension, peeling, reddening, dryness plus any improvement in skin condition. This means that week 0 (illustration 1) describes the initial condition and diagram 2 represent the changes to initial condition (diagram 1). The value zero in illustrations 2,3,4 and 5 thus represents no improvement compared to the initial condition. After just one week in the test group there was a slight tendency towards a subjective improvement in skin condition. This initial slight increase in skin satisfaction among the test participants compared with the control group increased during the course of the trial (week 2 to week 4) up to week 6, where there was a very clear difference (illustration 2). After 6 weeks of regular intake of plant juices 9 of the 10 test persons reported higher than average satisfaction with the effectiveness of the preparations (fresh plant juices) as well as improvement in the skin condition. Two participants were very satisfied with the overall improvement in skin condition, 7 reported medium improvement. About the improvement in skin

<table>
<thead>
<tr>
<th>pH-Metry</th>
<th>face control</th>
<th>Face Verum</th>
<th>forearm control</th>
<th>forearm Verum</th>
</tr>
</thead>
<tbody>
<tr>
<td>week 0</td>
<td>4.89±0.3</td>
<td>4.97±0.4</td>
<td>4.82±0.3</td>
<td>4.84±0.4</td>
</tr>
<tr>
<td>week 1</td>
<td>5.29±0.2</td>
<td>5.17±0.4</td>
<td>5.33±0.3</td>
<td>5.17±0.4</td>
</tr>
<tr>
<td>week 2</td>
<td>5.35±0.3</td>
<td>5.23±0.5</td>
<td>5.24±0.4</td>
<td>5.07±0.4</td>
</tr>
<tr>
<td>week 4</td>
<td>5.14±0.4</td>
<td>4.96±0.3</td>
<td>4.82±0.4</td>
<td>4.84±0.3</td>
</tr>
<tr>
<td>week 6</td>
<td>5.63±0.5</td>
<td>5.26±0.4</td>
<td>5.16±0.3</td>
<td>5.12±0.3</td>
</tr>
</tbody>
</table>
elasticity, skin smoothness and skin softness 3 participants were very satisfied and 6 averagely satisfied. As far as improvement in skin impurities, 4 were extremely satisfied and 5 quite satisfied. One of the participants reported a clear improvement in wrinkles, 7 reported average improvement and one slight improvement. (see diagram 2).

If the results of the control group are summarised, it is obvious that the skin care using basic cream alone no substantial improvement in skin condition was noted in the subjective reports of the participants (see diagram 2).

MEASUREMENT RESULTS

pH-Metry

The evaluation of the pH-Metry measurements showed no significant difference between the test group and the control group (see Table 1). Values ranged in the six weeks of the study in both groups mainly within the norm range (women 4.5-5.5). The values for the face showed an improvement by week 6, the values in the control group (without plant juice) had an average value (5.63) just above the norm in the alkaloid area. But no significant difference could be ascertained.

Results of the Corneometry

The values for a satisfactory skin hydration on the face are around >60 and for the forearm >50. Measurements on the face at week 0 on both groups were below the ideal values (see Table 2). While the control group in the course of the trial and in comparison to week 6 was below this value, the test group showed an increase in values up to week 6 (see Table 2). At the same time the results of the test group at week 6 was clearly above the ideal values whilst the values of the control group were always clearly beneath them. A significant difference (see Table 2) is evident. Skin moisturiness values for the forearm showed similar differences. The control group values were indeed slightly above the ideal level but the participants taking fresh plant juices had significantly higher results after 6 weeks in the average value (see Table 2). There was also a significant rise in values within the test group during the 6 weeks of juice intake, (see Table 2).

| Table. II |
|------------------|------------------|------------------|------------------|------------------|
| Average corneometry (*=p0,05) with standard deviation |
| corneometry | face control | face Verum* | forearm control | forearm Verum* |
| week 0 | 54,5±8,0 | 59±11,1 | 54,5±13,2 | 62,7±16,5 |
| week 1 | 51,5±8,2 | 55±9,5 | 41,9±6,5 | 52,8±9,4 |
| week 2 | 45,6±13 | 56,3±15,5 | 41,9±5,6 | 52,4±9,1 |
| week 4 | 61,8±7,7 | 68,4±12,2 | 56±12,2 | 65,5±13,7 |
| week 6 | 55,1±14,6 | 66,3±14,2 | 54,4±14,2 | 74±15,2 |
Results of Cutometry

The results of the skin elasticity measurements, apart from Parameter R8 in the face, showed no statistical significance. R8 is also referred to as visco part (= the area above the elasticity curve within a square formed of Ufx times suction time, the smaller this value, the more elastic the curve). The measurements of parameter R8 in the face of the participants of the test group showed a significant reduction (see Table 3) within the 6 weeks of juice intake. This points to an improvement in skin elasticity in the test group in comparison to the control group, which has a consistent range of measurements (see Table 3).

In Table 3 the comparative values over the 6 weeks are presented as average values. It was remarkable that the drop in R8 was very evident after just one week of juice intake and after Week 2 a further drop was evident. The values at Week 4 and 6 were stable but showed no further reduction. This allows the assumption that the effect of fresh plant juices in regard to the improvement in skin elasticity reaches its full effect in the first two weeks of intake. The values for the forearm showed no notable differences in the two groups (see Table 3).

The skin elasticity parameters R6 (Uv/Ue= part of visco -elasticity in the elastic part of the curve; the smaller the value the higher the elasticity) in both groups over 6 weeks show a clear reduction in values (see illustration 3) within the test group especially at week 1 and 2, after which the values are consistent, similar to the case of R8. In the control group there were no changes in the average value during the trials.

Results of Transmission Profilometry

In the measurements for skin roughness in both groups showed no significant change in values in the 6 week period.

DISCUSSION

After 6 weeks of skin care with basic DAC cream plus regular oral treatment with nettle and dandelion plant juices, the participants showed no significant change in pH values. However, since the values were found to be in the normal range before the start of the trials, no conclusions are possible as to whether treatment with fresh plant juices can influence pathological - e.g. alkaloid - pH values of the skin.

A significant improvement in skin hydration af-

<table>
<thead>
<tr>
<th>Parameter of skin elast. R8</th>
<th>face control</th>
<th>face Verum*</th>
<th>forearm control</th>
<th>forearm Verum</th>
</tr>
</thead>
<tbody>
<tr>
<td>week 0</td>
<td>6.879±0.9</td>
<td>8.989±2.4</td>
<td>7.655±2.1</td>
<td>8.645±1.7</td>
</tr>
<tr>
<td>week 1</td>
<td>6.73±0.7</td>
<td>7.733±1.7</td>
<td>7.851±2.6</td>
<td>7.908±2.4</td>
</tr>
<tr>
<td>week 2</td>
<td>6.658±1.2</td>
<td>6.572±0.9</td>
<td>7.49±1.5</td>
<td>7.875±0.9</td>
</tr>
<tr>
<td>week 4</td>
<td>6.621±12</td>
<td>6.615±1.1</td>
<td>7.435±1.9</td>
<td>8.26±2.1</td>
</tr>
<tr>
<td>week 6</td>
<td>7.126±1.5</td>
<td>6.51*±1.6</td>
<td>8.507±1.4</td>
<td>8.407±2.6</td>
</tr>
</tbody>
</table>
ter treatment with nettle and dandelion plant juices was shown, however, both in comparison with the control group and during the course of the trials (before and after). This effect was of course also partly brought about by the accompanying skin care with basic DAC cream [6], as the control group also showed an improvement in skin hydration. This however was not a significant difference.

Why clear effects were shown not earlier than week 6 could not be analysed within the scope of this observation – eventually therapy success starts after that interval.

Skin elasticity parameters R6 (part of visko-elasticity) and R8 (visko part) on the facial area showed a clear improvement after 6 weeks of oral treatment with nettle and dandelion plant juices. R8 showed a significant improvement (reduction) and R6 showed a clear but not significant change. This trial could not reveal completely the mechanism behind this change in skin elasticity.

In the literature, possible effects of plant juices on skin condition have not been described so far. Possibly the change in skin hydration and skin elasticity can be explained by the diuretic and detoxifying effects of the juices.

The study described in this article is a pilot project with a limited number of test cases. Final conclusions can not yet be drawn but have to be investigated in further studies.

No changes were noted in the roughness parameters on the forearms of participants. This allows several suppositions either the trial period was too short to be able to measure changes in the wrinkle profile of the skin; the number of trial participants was too small to make meaningful conclusions; or the intake of fresh plant juices indeed had no effect on improving the wrinkle depth of the skin.

This last conjecture is denied by the questionnaires, on which participants who had taken fresh plant juices subjectively expressed a clear improvement in wrinkle profile. Further evaluation of such subjective reports on the questionnaires showed a clear improvement in overall skin condition, skin smoothness and the effects of skin impurities.

These results strengthen the conjecture - insofar as this is possible with such a small number of test participants - that with the regular intake of nettle and dandelion plant juices both a subjective and measurable improvement in skin condition can be achieved.
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FIGURE 1: Subjective symptoms as well as satisfaction with skin of participants before the start of the trials (week 0). Brief explanation of the abbreviations used in the figures:
Subjective symptoms: br: stinging; juk: itching; spa: skin tension; schp: peeling; röt: reddening; trok: dryness.
satisfaction with skin: hab: overall skin condition; ela: elasticity; glat: smoothness; un: skin impurities; fal: wrinkles; wch: skin softness.

FIGURE 2: Subjective symptoms and improvement of the appearance of the skin, week 6.

FIGURE 3: Parameters for skin elasticity R6 (face) shown over a period of six weeks.
References


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