# The study the effectiveness of the juice of *Kalanchoe daigremontiana* grown hydroponically in the experiment

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**Abstracts:** The article describes the clinical efficacy of the juice of *Kalanchoe daigremontiana* grown hydroponically. This medicinal plant is cultivated in a special unit of his own design. Experiments were carried out on laboratory animals (rabbits). It was observed that the healing of wounds using the proposed method is more effective.

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**Keywords:** hydroponics, treatment of wounds, kalanchoe

## 1. Introduction

Wound healing is also a very important issue in medicine. Therefore, there is a constant search for new treatments for wounds [1]. We decided to engage in wound healing with the juice of Kalanchoe used in medicine [2,3,4].

The genus of a Kalanchoe includes about 205 species, all plants of this family have fleshy succulent stems and leaves. In not cultivated type of a Kalanchoe grows in tropical areas of Australia, the islands of New Guinea, Maluku and Madagascar, besides, one species meets in a tropical zone of America.

It is known that in the composition of Kalanchoe contains a glycosamine which is an invariable component of glycosaminoglycan's and hyaluronic acids, accepting active involvement in the synthesis of connective - tissue structures, and therefore the positive effect of glucosamine hydrochloride on recovery of damaged tissues.

In a cultivated form using all kinds of Kalanchoe as aren't whimsical and possess medicinal properties which weren't known until recently. Moreover, in traditional medicine, this plant is rarely used, though in places of wild growth the peoples who inhabit the territory for a long time and successfully apply the juice of Kalanchoe.

Traditional medicine as a result of such messages of the beginning of research of this unusual plant, and by the end of the 1960th years it found application in pharmacological practice as means for treatment of long not healing wounds and ulcers, fistulas and burns [5,6,7].

We suggested growing Kalanchoe one of the innovative methods of growing plants - hydroponics. The hydroponics is a generalizing agricultural term for designation of methods of cultivation of plants without the soil, with use of special solutions, containing the nutritious elements necessary for development of plants, in the necessary concentration, ecologically harmless, without GMC and various harmful additives in the course of which cultivation all potential of growth of a plant through creation of optimum conditions for growth of plants in the form of optimum structure of a nutrient medium is used, optimum access of roots to oxygen, the optimum length of light day created in hothouse conditions that leads to the most rapid growth of a plant, with preservation of all useful properties through observance optimum conditions of traditional habitat of a plant.

The group of researchers took part in a series of competitions on grant financing by an example of such participation the project participating in the competition of grants which held by the Ministry of Agriculture and the Ministry of Education, where it appeared the winner of competition (commision meeting of the Ministry of Agriculture of the Republic of Kazakhstan and the Ministry of Education, №6 03.19.2010, contract №SKR-2010-100). This project got a grant on implementation of the project for total amount about 8 million tenge ($55000).

In general the technique makes it possible to:

- increase the grade by a maximum realization of the genetic potential of vegetable plants;
- increase the yield ( 20-30 %) with a single crop;
- have a positive impact on the ecological environment by saving water and fertilizers, reducing the load on the ground compared to a dirt culture;

- effectively and efficiently use the available equipment through efficient use of space;
- reduce the cost of the final product;
- get earlier harvests of vegetables in greenhouses.
- allows to constantly receive fresh produce as it works a year round and provides a more rational approach to the periods of sowing.

Figure 1 (a)
(Hydroponic installation «The vertical garden bed 1»)

Figure 1 (b )
(Hydroponic installation «The vertical garden bed 2»)

Figure 1(c)
(Hydroponic installation « The vertical garden bed 3»)

When used in the construction of the waste product, which is very important and necessary for the economy of any country [8].

The aim of this study is to show the efficiency of application of juice of a kalanchoe grown up by a method a hydroponics on installations of own design.

**Tasks:**

To show the superiority of the juice of the kalanchoe grown up by a method a hydroponics on installations of own development relatively to kalanchoe juice received from the wild-growing and potted plants through a chemical composition of plants and practical application on rabbits.

**Materials and methods:**

The experimental work was carried out on 52 rabbits breed "White Giant" at the age of 2 years the average weight of 3.7 kg. Animals under local anesthesia had an incision in the back of 5-7 cm long from two sides. The wound was stitched on both sides using the usual circular vertical joints commonly used in surgical practice group 1, group A (control group). Stitches were placed at a distance of 1-1.5 cm from each other. 2 Group B ( investigated ) on the one hand (the control group ),there were no treatment and preventive measures, except for the change of dressings, aseptic and antiseptic. In the treatment of wounds, on the opposite side of the group B used the juice of kalanchoe, grown on our

hydroponic equipment of our own design. Hydroponic plant " BC 1,2, 3 " Figure 1 (a, b, c)
the effectiveness of healing was microscopically evaluated using the table 1, where the density and elasticity, the height of the scar over the wound and color were taken into account in summed scores. Results were recorded every day for 7 days.

In the course of clinical studies the ethical standards have been followed. The conclusion ofbioethics commission has been received.

**Table 1 ( macroscopic analysis)**

| Sign of scar | The degree of expression of a characteristic | Points |
|---|---|---|
| Density | Dense | 3 |
| | moderate density | 2 |
| | with areas of moderate density | 1 |
| | Soft | 0 |
| elasticity | not elastic | 3 |
| | Minimum elasticity | 2 |
| | Maximum elasticity | 1 |
| | Elastic | 0 |
| height of the scar (raise above the skin ) | more than 0.5 cm | 3 |
| | to 0.5 cm | 2 |
| | to 0.2 cm | 1 |
| | no rise | 0 |
| Color | red- purple | 3 |
| | Bright- Pink | 2 |
| | pale-pink | 1 |
| | flesh-colored, hypopigmented, hyperpigmented, depigmented | 0 |

**Results:**

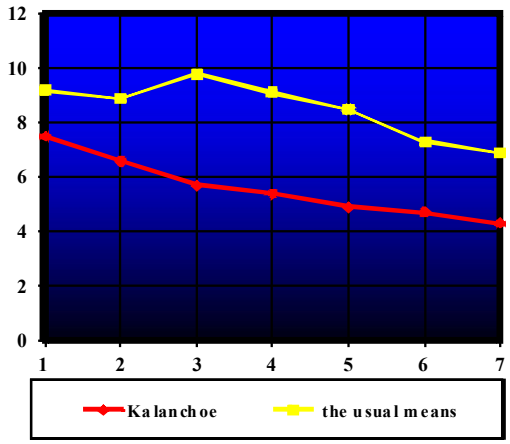
As a result of the chemical analysis of wild kalanchoe, kalanchoe raised as a houseplant and kalanchoe raised on hydroponic setting produced the following results Table 2):

Table 2. The chemical analysis of wild kalanchoe, kalanchoe raised as a houseplant and kalanchoe

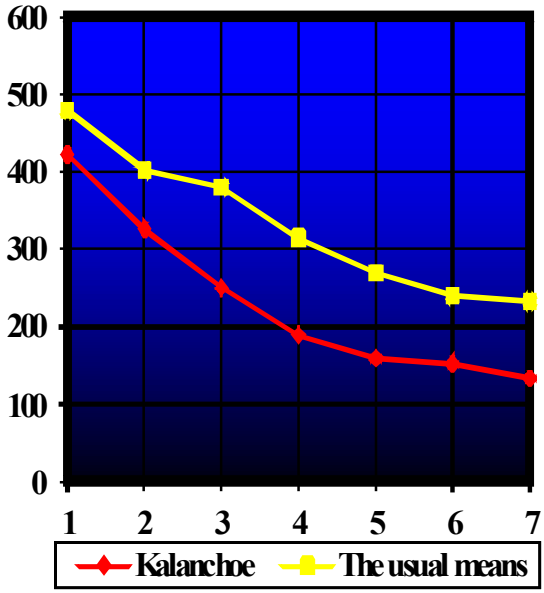
| The composition | Kalanchoe raised as a houseplant | Wild kalanchoe | Kalanchoe raised on hydroponic setting |
|---|---|---|---|
| Vitamin P | 1,3% | 1,2% | 1,4% |
| Vitamin C | 1,3% | 1,2% | 1,4% |
| Water | 94% | 90% | 93% |
| Ash | 37% | 33% | 35% |
| Hydrochloric acid | 0,026% | 0,032% | 0,032% |
| Tannins | 0,07% | 0,05% | 0,08% |
| polysaccharide substances | 1,4% | 1,2% | 1,6% |
| Aluminium | 1,4% | 1,2% | 1% |
| Calcium | 0,8% | 0,8% | 1% |
| Magnesium | 0,01% | 0,01% | 0,3% |
| Copper | 0,3% | 0,3% | 0,5% |
| Silicium | 0,025% | 0,025% | 0,036% |
| Manganese | 0,11% | 0,16% | 0,09% |
| Iron | 1,7% | 1,4% | 1,9% |

**The results of experiment on rabbits:**

- -In the 1st day of the experiment the sum of points in group 1 in average was 9.2 points, seam length 480 mm, while in group 2 - 7.5, seam length 422mm.
- -On day 2 the amount of points in group 1 did not change significantly 8.9points, the length of the seam 403 mm, while in group 2, the figure fell by almost 1 point and was 6.6. Joint length 326 mm
- -on day 3 the difference between macroscopic signs increased by 1.8 points. in the control group (A) was 9.8 points seam length 380 mm, and in group (B ) of 5.7 points seam length 250mm
- -On day 4 the difference in scores: the group (A) 9.1 points, seam length 315 mm, group ( B) 5.4 points, seam length 190 mm
- -On day 5, the difference in scores: the group (A) 8.5 points, the length of the seam 270mm Group ( B) 4.9 points, seam length 160 mm
- -On day 6 the difference in scores between the group (A) 7.3 points, the length of the seam 241mm Group ( B) 4.7points, seam length 153mm
- -On day 7, the difference in scores: the group (A) of 6.9 points, the length of the seam 233mm, Group (B ) 4.3 points, seam length 134mm.




*Graph 1 (X-axis night and Y-axis number of points)*




*Graph 2 along the length of the scar ( X-axis day on the Y-axis lengths in millimeters )*

Throughout the experiment there was marked the difference in scores in the two groups. The most prominent was the difference in the 3-4 day.

*Figure 2a (without application of a kalanchoe of 4days)*

*Figure 2b (with application of a kalanchoe 4days)*

The next days the difference in the sum of balls increased to 2,8 points. The length of the seam was on day 4 in the group where it was used kalonhoe juice 190 ml, in the group without the use of kalanchoe 315 ml (Figure 2a and b). It should be noted that 41 test animals from the side of wounds processed with juice of kalanchoe after 21 days from the beginning of the experiment t had cuts which could be visually detected only with indirect evidence, such as changes in pigmentation of the hair in place the surgical field, and in 2 rabbits were found allergic reaction, and it is worth mentioning the contraindications to the use of leaves, juice kalanchoe they are: pregnancy, Whipple's disease, glomerulonephritis, liver disease (especially hepatitis and cirrhosis of the liver), diseases of the joints and rheumatism, decompensated diabetes mellitus, hypersensitivity.

**Conclusions:**

Juice of the kalanchoe which has been grown up on a hydroponics with use of the equipment of own design, during experiment objectively showed the superiority on a chemical composition to rather wild-growing juice of the kalanchoe, and the kalanchoe to the grown up in room conditions. Shows a positive effect on the macroscopic characteristics of the wound, suggesting the possibility of its application in practical medicine for accelerating wound healing, and for use in plastic surgery to remove scar tissue.

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