COMPARATIVE STUDY OF WOUND HEALING ACTIVITY OF KHADIRA (ACACIA CATECHU WILLD) AND ARJUNA (TERMINALIA ARJUNA ROXB.) IN STREPTOZOTOCIN INDUCED DIABETIC WOUND IN SPRAGUE DAWLEY SPECIES ALBINO RATS.”

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ABSTRACT
In Ayurveda Khadira and Arjuna are mentioned in Kashayaskandha (Group of astringents). Both possess Sheet Veerya, Katu vipaka and Ruksha guna, Pramehagna (anti-diabetic), Shothhar (antiinflammatory) properties. The present study was performed to compare diabetic wound healing activity of Khadira (Acacia catechu willd.) and Arjuna (Terminalia Arjuna Roxb.) in streptozotocin induced albino rats. All rats were injected with STZ intraperitoneally to induce diabetes. After a period of 1 month these diabetic animals were distributed in the different groups (n=6) such as DC (Disease control), STD (Standard drug), Test 1 drug (Khadira), Test 2 drug (Arjuna). Circular excision was made on a dorsum of every animal. Test drugs were applied to respective groups and wound area was measured on days 0, 3rd, 6th, 9th, 12th and 15th for all groups. Aqueous extract of Khadira and Arjuna both responded both of them have showed diabetic wound healing effect. The wound healing activity is more effective in Arjuna extract as compared to Khadira extract due to presence of tannin in high intense in Arjuna than Khadira.

KEYWORD: Khadira, Arjuna, Tannin, diabetic wound.

INTRODUCTION
Diabetic wound is the complication of diabetes. Approximately 15% of diabetics will develop a foot ulcer at some point.[1] Ayurveda described ‘Kleda’ (metabolic waste) & Bahudravashlesha (liquefied & excessive amount of kapha) as the main causative factors leading to Dhatusahithyana in pathogenesis of Prameha. In charka Samhita, vimanthan chapter 8 Khadira (Acacia catechu Wildl) & Arjuna (Terminalia arjuna Roxb) are included in kashay skandha.[2] Khadira plays an important role in kledashoshan (Absorbing Kleda). Dhatusahithyana (destroys Dhatusahithyana) beside this kashay rasa has vranropan (wound healing) property.[3] According to Acharya Sushruta says that kushtha (Skin disease), vish (Poison), shosh (Tuberculosis), Madhumeh (Diabetes) are responsible factor for Vrana ropan. Madhumeh is a Kruchhasadhya disease.[4] Laboratory trials of Khadira and Arjuna extracts have shown the wound healing property without harming healthy cells. Therefore, there is a continuing search for better control & preventive methods in order to reduce wound healing & related side effects. The over use of synthetic drugs resulting in higher incidence of adverse drug reaction has motivated mankind to go back to nature for safer remedies.

Bhavaprakash Nighantu, Madanpal Nigantu, and Kaidyade Nighantu have stated the wound healing and anti-diabetic property of Khadira.[5,6,7] The anti-diabetic & wound healing potential of Arjuna has been mentioned in Bhavaprakash Nighantu and Kaidyade Nighantu.[8,9]
These both drugs possess predominant kashay rasa, sheet veerya and katu vipak\textsuperscript{[10]} The useful part of Khadira as well as Arjuna is similar that is bark. Acacia catechu Willd is a species of mimosaceae family and Terminalia arjuna Roxb is the species of Combretaceae family. It is used in the treatment of some major diseases. The anti-diabetic and wound healing activity are associated with their component like tannin, flavanoids, and alkaloid.\textsuperscript{[11]} Various preclinical investigation has been carried on Khadira (Acacia catechu Willd) and Arjuna (Terminalia arjuna Roxb) such pharmacological activities are Anti ulcer activity, Anti carcinogenic and anti lipid per oxidative, Anti microbial, Ant-inflammatory and analgesic, wound healing these activities present in both drugs the plant is enrich with reported wide range of chemical constitute.

The validation of their therapeutic attributes has to be made evidence based by using modern scientific methods. No drug can be tested for its pharmacological action unless it is standardized for its quality and efficacy, identity, purity & quality of raw drugs are the essential requirements for preparation of the drug formulation significance the standard of the drug should be undertaken as initial part of this study. Recently world is being attracted towards medicinal plants but there is question about purity of herbal drugs. Potency and efficacy is closely related with chemical and physical property. So there is need of standardization of medicinal plants. Therefore, for the purpose of quality and purity of drugs standardization of Khadira and Arjuna has been undertaken \textsuperscript{[11]}. Though Ayurveda is a fully developed medical science, but the drugs used in it are not studied on the basis of modern parameters. Considering this fact in mind, throw light in terms of Pharmacognostical and phytochemical analysis of Khadira and Arjuna was also taken under consideration. It is essential to carry out preclinical studies using animal model. As no research work is available on wound healing activities of Khadira and Arjuna in diabetic rats. In this study Sprague Dawley albino rats selected for the experiment. It is in vivo study or animal experimentation, animal research and in vivo testing is use of non human animals in experiments that seek to control the variables that affect the behavior or biological system under study. In vivo study is the study of the biological effects of a drug in living organisms. In vivo models or animal models of human diseases are used to observe the physiological effects of a drug. Testing drugs candidates in animals is necessary step to understand the candidate behavior in the whole organism, starting from bioavailability and going through pharmacokinetics, organ exposure, efficacy in animal models of disease, and to a potential toxicity of either the compound itself or its metabolite. These are two most potent drugs widely used in Ayurveda in anti-diabetic and wound healing so the efficacy of these two drug in experimental wound healing in the present investigation offer the potential for reaching on understanding of wound healing potencial.

MATERIALS AND METHODS

Plant material
The botanically identified samples, The Bark of Acacia catechu wild (Khadira) and Bark of Terminalia arjuna Roxb (Arjuna) were collected. The sample was authenticated for its botanical identity, row drugs and Physico-chemical standardization is carried out in well-known research laboratory Dr. Bhide foundation, SP college in Pune, Maharashtra.

Drug standardization
Organoleptically, both drugs have Astringent in taste and Characteristic Odour. Khadira was rough in touch, Greyish brown in Colour while Arjuna was Smooth in touch, whitish in Colour. In microscopic study, it was found that the transverse section of bark of Khadira, showed numerous, uni-to-bi-seriate medullary rays, vessels occurring isolated or in small group of two to four, xylem fibers. And T.S. of Arjuna showed a few outer layers filled with brown coloring matter; phloem Parenchyma and phloem fibers, rosette crystals of calcium oxalate, starch grains, mostly simple to compound.

Physico-chemical standardization
In Khadira, Alcohol soluble and water soluble extractive values were 26.17% and 28.63% respectively. Total ash value was 3.22%, Moisture content was 2.67% and pH values was 5.61 whichwas found to be within limit as specified in API. In Arjuna, Alcohol soluble and water soluble extractive values are 10.68% and 23.31% respectively. Total ash value was 1.71%, Moisture content was 3.02% and pH values was 5.23 which was found to be within limit as specified in API.

Preparation of aqueous extracts and standardization
Aqueous extracts of Khadira and Arjuna were prepared in APT research center, Pune. For Preparation of aqueous extract of bark of Khadira and Arjuna Standard method (Soxhlet extraction) was used. These extracts were used for pre-clinical study. Phytochemical tests revealed the presence of tannin and alkaloids in both drugs extracts. Also HPTLC profile of Aqueous extracts of both drugs tested using different solvents confirmed the presence of Tannin and flavonoids in both Arjuna and Khadira. In Khadira, Saponin, Triterpinoids, bitter principle were found in high intense than Arjuna.

Experimental animals
The experimental protocol was approved by institutional animal ethical committee in APT testing and research private limited, Research project no.35/1819. Rats of strain Sprague Dawley were used for the study. All animals taken were Either Male/Female. Body weight of rats was ranging from 200.0 gm to 250.0 gm. Total animals used for study were 24. The rats were housed in their cages for five days prior to start of dosing in the experimental room after veterinary examination.
Diabetic wound
After induction of diabetes animals were anaesthetized by injecting intramuscularly ketamine hydrochloride and xylazine in 1:1 concentration. The dorsal fur of the animals was shaved with shaving machine. The area of the wound created was marked on the back of the animals by Marker using circular stencil. Circular excision wound of 300 to 350 mm² created to full thickness along the markings using toothed forceps and pointed scissors. Test drugs were applied to respective groups for 15 days. Wound areas were measured on days 0, 3rd, 6th, 9th, 12th and 15th for all groups, using a transparency sheet and a permanent marker and measured by using graph paper and entire wound was kept open. At the end of study Hematology, Biochemistry (Glucose, Total Protein, Urea, Creatinine, Triglyceride, HDL- Cholesterol, Cholesterol, SGPT, SGOT and ALP) was done before sacrifice. Tissues were preserved in 10% formalin for Histopathology of major organs (Skin tissue, Liver, Kidney and Pancreas).

Study design
Table 1: Experimental study design.

<table>
<thead>
<tr>
<th>Group no.</th>
<th>Group name</th>
<th>Specification (n=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC</td>
<td>Disease Control</td>
</tr>
<tr>
<td>2</td>
<td>STD</td>
<td>Standard- 0.2% Silver nitrate Gel</td>
</tr>
<tr>
<td>3</td>
<td>TEST 1</td>
<td>Khadira Kalk</td>
</tr>
<tr>
<td>4</td>
<td>TEST 2</td>
<td>Arjuna Kalk</td>
</tr>
</tbody>
</table>

Administration of drug
Dosing of Standard and test drug was started after confirming induction of diabetes and formation of diabetic wound in animals.

Day on which first dose given was considered as 0 day.

Standard drug-After induction of diabetes and formation of diabetic wound; Standard drug was administered for the duration of 15 (0th, 3rd, 6th, 9th, 12th, 15th) days to rats in standard drug group. Silver nitrate was given as a standard drug at the dose of 0.2% locally.

Test drug-After induction of diabetes then create diabetic wound; test drugs were administered for the duration of 15 days to evaluate its anti-wound healing activity.

The gel is prepared which is used for the local application.

The animals were dosed using a stainless steel intubation needle fitted onto a suitably graduated syringe.

Testing parameters
Wound healing
a. Measurement of wound contraction period-
In the wound model, wound area was measured by tracing the wound with the help of transparent sheet using millimeter based graph paper on days 0, 3, 6,9,12 and 15 for all groups.

Wound contraction was measured every 3rd day until complete wound contraction was calculated taking the initial size of the wound as 100% using the following formula:

\[
\text{% wound contraction} = \frac{\text{Initial wound size-specific day wound size}}{\text{Initial wound size}} \times 100
\]

b. Epithelization period-was calculated as the number of days required for falling off the dead tissue remnants of the wound without any residual raw wound.[183]

c. Body weight- Animals in all groups were weighted on weighting scale weekly and observations were noted.

d. Blood glucose level- 0.5 ml of blood was collected for testing blood glucose level of each animal. It was done by sterilizing the tail of animal with 10% alcohol and then nipping the tail. Test was performed weekly and observations were noted.

Sacrifice of animals
After 15 days of dosing, all animals of four groups were euthanatized by using CO₂ chamber. Each dead animal was dissected and their organs like Adrenals, Heart, Kidney, Liver, Spleen, Lungs, Gonads, Brain and Pancreas were weighted using weighting scale.

Some tissues were preserved in 10% formalin for Histopathological tests.

Histopathological study
At the end of the study, all the animals were anesthetized using ketamine and specimens of wound tissue were collected and preserved in glass vials containing 10% formalin solutions for histological examination. Sections for histological examination. Sections of wound tissue specimens (about 5um thickness) were prepared by microtomy and stained with hematoxylin and eosin (H & E) dye for histological examination.

Statistical method used
For analysis of data obtained from in-vivo evaluation of aqueous extract of *Acaia catechu* Willd and *Terminalia arjuna* Roxb was calculated by using one way ANOVA
test. Total four groups are used in present study. So that, for more than two sample means ANOVA test was used. It is a parametric test. In this test instead of analysing SD, analysis of the variance of more than two means was performed and hence it called ‘analysis of variance’. This test is used to test the homogeneity of more than two samples.

**OBSERVATION AND RESULTS**

![Graph 1: Wound Area (mm²).](image1)

In all animals of 4 groups wound area was measured on 0th, 3rd, 6th, 9th, 12th, 15th day and the readings are as follows.

- In rats of 1st disease control group wound area decreased day by day. Reading was recorded at 6 respective days. The wound area of all rats at 0th day was 476.8 mm² and at the end of study that is at 15th day was 232.6.
- In 2nd group i.e standard disease control group mean wound area at 0th day was 423.0 mm² and at 15th day was 84.4 mm². At 0th, 3rd, 6th, 9th, 12th, 15th day total 6 rats died.
- In 3rd group of diabetic wound albino rats treated with first test drug aqueous extract of *Acacia catechu* Willd mean wound area at 0th day was 459.7 mm² and at 15th day was 84.0 mm².
- In 4th group with test drug *Terminalia arjuna* Roxb mean wound area at 0th day was 434.8 mm² and at 15th day was 77.6 mm². Two rats from this group get died at 12th and 15th day.

There was statistical change observed in the Wound area was found to be decreased on day 6 (STD p<0.001; Test 1 p<0.05), day 9 (STD p<0.001; Test 1 p<0.01; Test 2 p<0.001), day 12 (STD p<0.001; Test 1 p<0.001; Test 2 p<0.001) and day 15 (STD p<0.001; Test 1 p<0.001; Test 2 p<0.001) in respective treatment group in comparison with DC group.

![Graph 2: Wound contraction %.](image2)

In all animals of 4 groups wound contraction % was measured on 0th, 15th day and the readings are as follows.

- In rats of 1st disease control group wound contraction % decreased day by day. Reading was recorded at 2 respective days. The wound contraction % of all rats at 0th day was 476.8 mm² and at the end of study that is at 15th day was 232.6. At 0th, 15th day total 2 rats died.
- In 2nd group i.e standard disease control group mean wound contraction % at 0th day was 423.0 mm² and at 15th day was 84.4 mm². At 0th, 15th day total 2 rats died.
In 3rd group of diabetic wound albino rats treated with first test drug aqueous extract of *Acacia catechu* Willd mean wound contraction % at 0th day was 459.7 mm² and at 15th day was 84.0 mm². At 15th day 2 rats died.

In 4th group with test drug *Terminalia arjuna* Roxb mean wound contraction % at 0th day was 434.8 mm² and at 15th day was 77.6 mm². Two rats from this group get died at 12th and 15th day. At 15th day 1 rats died

Percentage wound contraction was measured at the end of experiment. The percentage of wound contraction was more in all treatment groups in comparison with DC group (p<0.001).

### Table 2: Percentage of Wound Contraction in various Extract

<table>
<thead>
<tr>
<th>Extract</th>
<th>Day 0th</th>
<th>Day 15th</th>
<th>% Wound contraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease Control</td>
<td>476.8%</td>
<td>232.6%</td>
<td>49.77%</td>
</tr>
<tr>
<td>Standard-0.2% Silver nitrate Gel</td>
<td>423.0%</td>
<td>84.4%</td>
<td>79.87%</td>
</tr>
<tr>
<td>Aqueous extract Khadira (<em>Acacia catechu Willd</em>)</td>
<td>459.7%</td>
<td>84.0%</td>
<td>81.39%</td>
</tr>
<tr>
<td>Aqueous extract Of Arjuna (<em>Terminalia arjuna Roxb</em>)</td>
<td>434.8%</td>
<td>77.6%</td>
<td>81.77%</td>
</tr>
</tbody>
</table>

### Epithelialization Period

- Epithelialization in the wound study was very slow in the disease control rats as scab formation was delayed and eschar was not seen to be present till 15th day of the study period.
- However in the standard drug treated rats, scab formation was early and eschar fell on the 9th to 12th Day of wound formation.
- Similarly, in both the test groups the epithelialization was seen early as a sign of collagen turnover and eschar was peeled off much earlier as compared to other groups leading to early wound healing.

### Table 3: Epithelization period.

<table>
<thead>
<tr>
<th>Extract</th>
<th>Epithelization period</th>
</tr>
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<tbody>
<tr>
<td>Disease Control</td>
<td>No epithelialization</td>
</tr>
<tr>
<td>Standard-0.2% Silver nitrate Gel</td>
<td>11.40</td>
</tr>
<tr>
<td>Khadira Kalk(<em>Acacia catechu Willd</em>)</td>
<td>11.25</td>
</tr>
<tr>
<td>Arjuna Kalk (<em>Terminalia arjuna Roxb</em>)</td>
<td>9.80</td>
</tr>
</tbody>
</table>

In all animals of 4 groups Body weight was measured on 0th, 7th and 14th day the readings are as follows.

- In rats of 1st disease control group body weight increased day by day. Reading was recorded at 3 respective days. The body weight of all rats at 0th day was 253.1gm and at the end of study that is at 14th day was 275.0gm.
- In 2nd group i.e standard disease control group mean body weight at 0th day was 260.8gm and at 14th day was 278.6gm. At 0th, 14th day total 2 rats died.
- In 3rd group of diabetic wound albino rats treated with first test drug aqueous extract of *Acacia catechu* Willd mean body weight at 0th day was 251.6gm and at 14th day was 265.1gm.
In 4\textsuperscript{th} group with test drug *Terminalia arjuna* Roxb mean body weight at 0\textsuperscript{th} day was 254.7gm and at 14\textsuperscript{th} day was 267.0gm One rat from this group gets died at 14\textsuperscript{th} day.

In all animals of 4 groups Glucose was measured on 0\textsuperscript{th}, 7\textsuperscript{th} and 14\textsuperscript{th} day the readings are as follows.

- In rats of 1\textsuperscript{st} disease control group Glucose level at 0\textsuperscript{th} day was 248.0 mg/dl and at the end of study that is at 14\textsuperscript{th} day was 275.0 mg/dl.
- In 2\textsuperscript{nd} group i.e standard disease control group mean glucose level at 0\textsuperscript{th} day was 257.3 mg/dl and at 14\textsuperscript{th} day was 278.6 gm/dl. At 0\textsuperscript{th}, 14\textsuperscript{th} day total 2 rats died.
- In 3\textsuperscript{rd} group of diabetic wound albino rats treated with first test drug aqueous extract of *Acacia catechu* Willd mean glucose level at 0\textsuperscript{th} day was 243.3mg/dl and at 14\textsuperscript{th} day was 257.9mg/dl.
- In 4\textsuperscript{th} group with test drug *Terminalia arjuna* Roxb mean glucose level at 0\textsuperscript{th} day was 250.5mg/dl and at 14\textsuperscript{th} day was 255.0mg/dl. One rat from this group gets died at 14\textsuperscript{th} day.

**Glucose- Graph 4:**

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In 4\textsuperscript{th} group with test drug *Terminalia arjuna* Roxb mean body weight at 0\textsuperscript{th} day was 254.7gm and at 14\textsuperscript{th} day was 267.0gm One rat from this group gets died at 14\textsuperscript{th} day.

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Day 15

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<td></td>
<td>LH</td>
<td>HLS</td>
<td>T-HLS</td>
<td>T</td>
<td>RF</td>
<td>RLS</td>
</tr>
</tbody>
</table>
DISCUSSION

Discussion on analysis of In-Vivo study

Effect on Wound area
Wound area was measured weekly during the study period of 15 days. In disease control group there was statistical change observed in the Wound area was found to be decreased on day 6 (STD p<0.001; Test 1 p<0.05), day 9 (STD p<0.001; Test 1 p<0.01; Test 2 p<0.001), day 12 (STD p<0.001; Test 1 p<0.001; Test 2 p<0.001) and day 15 (STD p<0.001; Test 1 p<0.001; Test 2 p<0.001) in respective treatment group in comparison with DC group.

Effect on % wound contraction
% Wound contraction was measured weekly during the study period of 15 days. Percentage wound contraction was measured at the end of experiment. The percentage of wound contraction was more in all treatment groups in comparison with DC group (p<0.001).

Effect on epithelisation period
Epithelialization in the wound study was very slow in the disease control rats as scab formation was delayed not seen to be present till 15th day of the study period. In the standard drug treated rats, scab formation was early and eshar fell on the 9th to 12th Day of wound formation. In both the test groups the epithelialization was seen early as compared to other groups leading to early wound healing.

The result indicated a statistically significant reduction in epithelization period of excision wound model compared with contraction (p<0.005).

Effect on Body weight
Body weight was measured during the study period of 15 days. The body weight increased day by day. In disease control group, there was statistically increased in body weight observed on day 15 as compare to day 0. In STD group, Test 1 (Khadira) group, Test 2 (Arjuna) group showed improvement in body weight on 15th day. The increase in body weight could be due to amelioration of glycemic control and structural protein synthesis.

Effect on glucose (mg/dl) level
After application of an ointment the increase in blood glucose level in disease control (1st group), ST drug (2nd group), Khadira extract (3rd group), Arjuna extract (4th group) was 27mg/dl, 21.3mg/dl, 14.6 mg/dl and 4.5 mg/dl respectively. This observation indicates that increase in blood sugar level with Arjuna extract was externally less i.e. only 1.8% as compared to Khadira extract (6%). Increase in BSL in D.C was 10.89% in ST drug it was 8.27%. Thus in Comparision with all groups, Animals treated with local application an ointment with Aqueous extract of Arjuna showed negligible increase in the blood sugar level.

Discussion on Histopathology
The Histopathological examination of rats skin treated with aqueous extract of Khadira and Arjuna showed increased number of fibroblasts, well-formed hair...
follciles with no macrophages and inflammatory cells which are comparable to the standard. Histopathological examination of aqueous extract of Arjuna shows large no of macrophages, inflammatory cells, fibroblasts and well-formed hair follicles than aqueous extract of Khadira.

Mode of Action

Probable mode of action of aqueous extract Khadira and Arjuna as diabetic wound healing agent according to Ayurveda

In order for healing of the wound to occur, the wound must undergo vrana shodhan (cleansing of wound) and vrana ropan (wound healing) passing through the four stages of the wound healing process: dushita vrana (septic wound), Shuddha vrana (clean wound), Ruhayamana vrana (healing wound), and rooddha vrana (healed wound) wounds are observed when the doshas are pacified. Both the drug Khadira and Arjuna shows the presence of Kashya rasa, Khadira has tiktta rasa along with kashay rasa.

As kashay rasa has Sandaneeya property due to its shleshmaprashamhan (alleviation of kapha) & kledashoshan (absorption of kleda).[12] According to Ayurveda Kashaya rasa performs Raktavishodhan (Blood purification) & Kledovishoshan (absorption of kleda) karma (action) helps in wound healing. As kashay ras constricts Rasa & Raktavaha sira (blood vessels) in the wound region, Vranaushth sankoche (contraction of wound) occurs which helps in speedy wound healing. This rasa has Shonitasthapan (Haemostatic) property which stops bleeding in the wound area. Thus all these properties of Kashay Rasa aid fast healing of wound.[13]

Probable mode of action of Aqueous Extract of Khadira and Arjuna as diabetic wound healing agent according to Modern

The compound identified from the aqueous extract of Khadira and Arjuna with the help of HPTLC. These compounds have been classified in appropriate chemical groups and data are reported on their pharmacological activities, mechanism of actions which have wound healing effect. Tannin is a main phytoconstituents which are responsible for wound healing activity of Arjuna. Arjuna shows more wound healing activity than Khadira. Activites of these compounds against wound healing are as follows:

Tannins- Tannins are one of the important phytoconstituents responsible for wound healing mainly due to their astringent and antimicrobial property. Tannins are polymeric phenolic substances possessing the astringent property. These compounds are soluble in water, alcohol and acetone and precipitate with proteins. The ability of Tannins to form a protective layer over the exposed tissue keeps the wound from being infected even more. Tannin has been reported to have Anti-viral, antibacterial and antiparasitic effects.[14]

In addition to flavonoids variety of tannins have been isolated from the bark of Terminalia arjuna. Some of the well-known hydrolysable tannins from the bark are pyrocatechols, punicalin, punicalagin, terchebulin, terflavin C, castalagin, casuarin and casuarinin. Some 15 types of tannins and related type of compounds have been isolated from its bark so far. It is also speculated that tannins may be responsible for its astringent, wound healing and anti microbial activity.[15]

Tannin also reduced oxidative stress, ET-1, and inflammatory cytokine levels.

There results strongly document the beneficial effect of aqueous extract of Arjuna consisting mainly of Tannins in acceleration of wound healing process. Thus present study validates the claim made w.r.t the plant as well as corroborating the astringent effect of Tannin by drawing the tissue closer together.

Discussion on efficacy of Aqueous extract of Arjuna more than Khadira

Both drugs contain flavonoids and tannin in high intense. But in Arjuna, tannin were found in high intense as compared to Khadira i.e Arjuna shows more diabetic wound healing effect than Khadira. This validates the claim made in Ayurveda that Arjuna is useful in Meharvana (Diabetic wound) as stated in Bhavprakash nighantu.

Thus this investigation confor the use of the gel containing Arjuna extract as a wound healing agent as known from Ayurveda.

CONCLUSION

Aqueous extract of Khadira and Arjuna both responded in Comparision with control group drug in animal model Sprague Dawley rats. Both extract more effective, but Arjuna is more effective than Khadira. Based on observation, between them aqueous extract of Arjuna is more effective as diabetic wound healing agent than aqueous extract of Khadira in experimental rats. It is due to Arjuna aqueous extract has shown increase in % wound contraction activity as compare to disease control group and as well as Khadira aqueous extract. The size of wound in the animals treated with aqueous extract of Arjuna was decreased when compared with size of the wound in animals treated with control group and as well as Khadira aqueous extract. Based on observation, Arjuna aqueous extract shown reduced Epithelization period as compare to disease control group and as well as Khadira Aqueous extract. Thus in Comparision with all groups, Animals treated with local application an ointment with Aqueous extract of Arjuna showed negligible increase in the blood sugar level. Histopathological examination of aqueous extract of Arjuna shows large no of macrophages, inflammatory cells, fibroblasts and well-formed hair follicles than Aqueous extract of Khadira. In Khadira and Arjuna, class of compounds Flavonoids and Tannin were
found in high intensity. The wound healing activity is more effective in Arjuna extract as compared to Khadira extract due to presence of Tannin in high intense in Arjuna than Khadira. Pharmacognostical study using Khadira and Arjuna bark complies the standard monographs, and hence it was concluded that the drug used for the study was Acacia catechu willd and Terminalia arjuna Roxb. The observed phytochemical results of Arjuna and Khadira bark are similar to the standard values which are available in A.P.I. These results are stated on the basis of pre-clinical trials and clinical trials are needed. The most imp observation was that no adverse reactions were encountered.

REFERENCES

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