

A NEW ANTIMICROBIAL AGENT FROM ALMOND (*PRUNUS AMYGDALIS*) SHELLS

By

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A constant search for a perfect antibacterial agent since the time of Lister, has brought in a chain of antiseptics and antibiotics, but there is none which could satisfy all the essentials required for topical use in various infections.

A couple of years ago the author observed that a solution derived from almond shells when applied over recently inflicted wounds prevented the infection, and in cases of already infected wounds the infection cleared up and the process of healing was hastened.

Infection of the wounds plays a dominant role in the mortality in post burn period and in increasing the morbidity by converting the partial thickness burns to full thickness burns. The burn wound sepsis is the established source of fatal septicaemias and owing to the wide spread nature of the wound the systemic chemotherapeutic agents may not act effectively. The most effective therapy is, naturally, the topical one.

Inspired by these observations of antimicrobial activity of this drug, the author carried out clinical trials on burn wounds where the infection prevents the process of healing. The results have been very encouraging while carrying out the preliminary trials on burns. It was thought worth-while to carry out a detailed study of the anti-bacterial activity of the agent on scientific lines.

MATERIALS AND METHODS

Pus from burn wounds and abscesses was cultured and organisms identified. The organisms were also cultured from urine, sputum, conjunctival swabs, ear discharge, peritoneal and pleural fluids. These organisms were cultured from the routine specimens received in the Pathology Department of Medical College Amritsar. A total number of 1412 organisms obtained from various specimens were tested for their sensitivity to the new agent by the method described below :

A single representative colony of the organism was sub-cultured in peptone water. Six hours later simple agar plate was flooded with this culture. The excess was drained off and the plate dried in incubator for about half an hour. Four millimetre disc just soaked in the solution of this drug was placed in the above mentioned plate. The plate was incubated overnight and the result recorded next morning for the presence or absence of the zone of inhibition. The zone of inhibition was measured in millimetres.

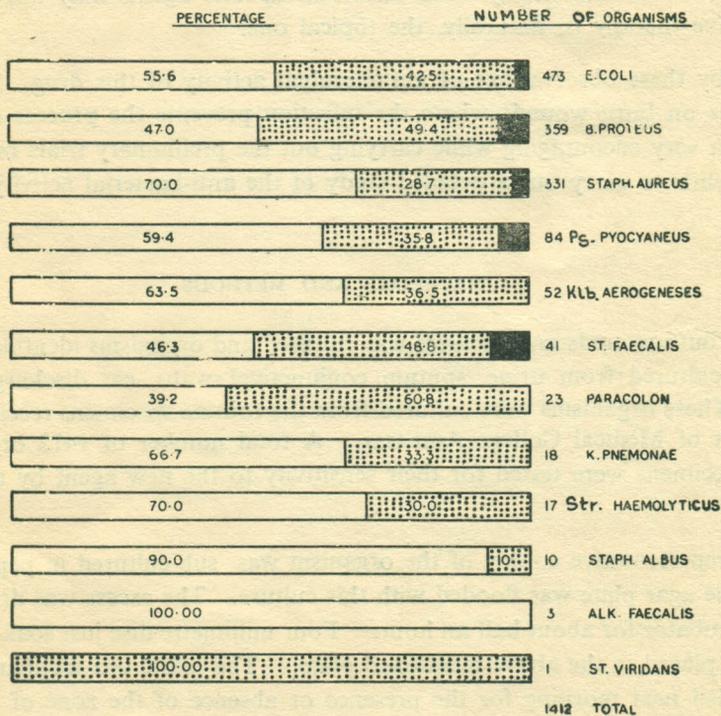
A comparative study of the antibacterial activity with other antiseptics was also carried out on various strains of organisms.

Similar substances were extracted from walnut shells, apricot seed shells and sheesham wood and in vitro studies for the sensitivity were carried out by disc method.

OBSERVATIONS

TABLE I

| Total No. of Organisms | Organisms | No. | Sensitive Zone of inhibition in M.M. | | | | Resistant |
|---------------------------|-------------------|-----|---|----------|----------|----------|-----------|
| | | | 6 to 12 | 12 to 20 | 21 to 30 | 31 to 40 | |
| | | | 4 | 5 | 6 | 7 | |
| 1412 | Staph Pyogenes | 331 | 95 | 174 | 54 | 4 | 4 |
| | E. Coli | 473 | 202 | 221 | 38 | 4 | 8 |
| | B. Proteus | 359 | 178 | 135 | 33 | .. | 13 |
| | B. Pyocyaneus | 84 | 30 | 31 | 18 | 1 | 4 |
| | Kleb aerogenes | 52 | 19 | 21 | 12 | .. | .. |
| | Str. faecalis | 41 | 20 | 19 | .. | .. | 2 |
| | Kleb. pnemonae | 18 | 6 | 10 | 2 | .. | .. |
| | Paracolon | 23 | 14 | 7 | 2 | .. | .. |
| | Str. haemolyticus | 17 | 5 | 10 | 2 | .. | .. |
| | Str. Viridan | 1 | 1 | .. | .. | .. | .. |
| | Alk. faecales | 3 | .. | 3 | .. | .. | .. |
| Staph. Albus | 10 | 1 | 5 | 4 | .. | .. | |



KEY

□ HIGHLY SENSITIVE

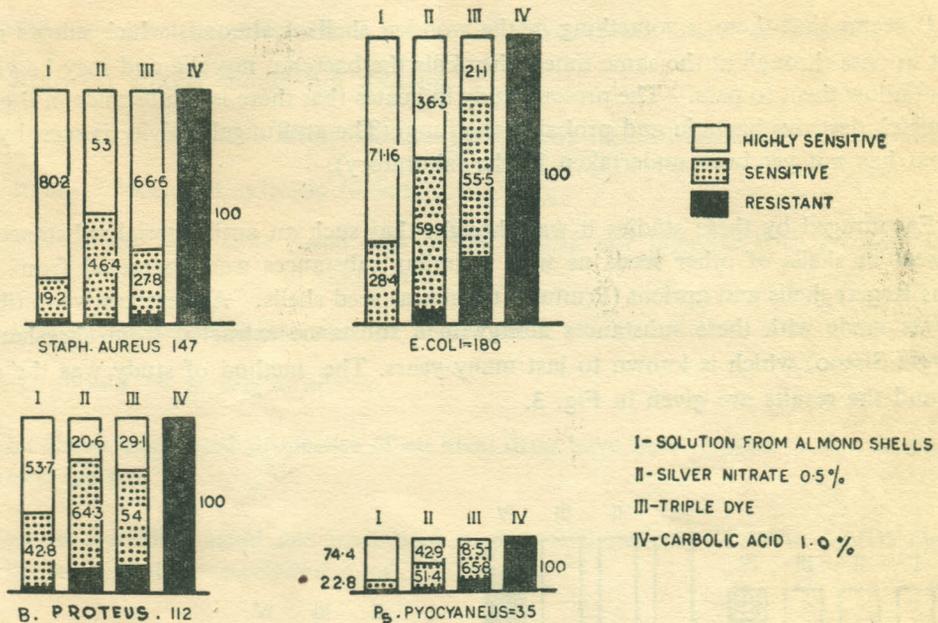
▨ SENSITIVE

■ RESISTANT

SENSITIVITY OF ORGANISMS TO
NEW ANTIMICROBIAL AGENT

Fig. 1

It is seen from Table I and fig. 1 that most of the pathogenic organisms which infect wounds are sensitive to this drug. The resistant organisms are less than 2% in E. Coli and Staphylococci, which are the commonest organisms found in wounds. Even the organisms like Ps. Pyocyaneus, B. Proteus which are extremely difficult to eradicate from the wounds are sensitive to this drug, the resistant organisms being only 2.8% in Ps. Pyocyaneus and 3.6% in B. Proteus.



CAMPARATIVE SENSITIVITY TEST OF VARIOUS ANTISEPTICS WITH THE NEW DRUG.

Fig. 2

Comparative study of the sensitivity with other drugs reveals that the new agent which is an un-diluted solution of extract from almond shells is most potent against the common organisms which infect wounds as compared to triple dye, silver nitrate (0.5%) and carbolic Acid (1%).

DISCUSSION

It will be seen from the above studies that this drug has a very wide and strong antibacterial activity and the clinical observations support the same.

This drug is derived from the shells of almonds. This is solution which is pale yellow in colour but gets darker if exposed to air for some hours.

The reason for the antibacterial, antifungal and may be anti-viral activity of this drug may not be far to seek. Nature has provided a wooden house to the embryo (almond) which is a living seed. The living seed needs oxygen and moisture for its existence. It is well known that almond seeds when lying in their shells (wooden house) can remain alive for many years, while if they are taken out of the shell will perish in a few days or weeks. This fact has been verified from the dealers of almonds. The almond in its shell will grow when planted even after years of preservation while if the seed is taken out of the shell for sometime it will not germinate.

It seems that there is something in the wooden shell of almonds which allows moisture and air to pass through at the same time either kills the bacteria, mycelia and may be viruses or does not allow them to pass. The present study indicates that there is a substance in the almond shells which destroys bacteria and probably the fungi (The antifungal activity is seen by clinical trials but has not yet been undertaken in the laboratory).

Encouraged by these studies it was thought that such an antibacterial substance should be present in shells of other seeds as well. Similar substances were extracted from walnut (*Juglans Regia*) shells and apricot (*Prunus Armeniaca*) seed shells. A comparative antibacterial study was made with these substances alongwith a substance extracted from sheesham wood (*Dalbergia Sissoo*) which is known to last many years. The method of study was the same as above and the results are given in Fig. 3.

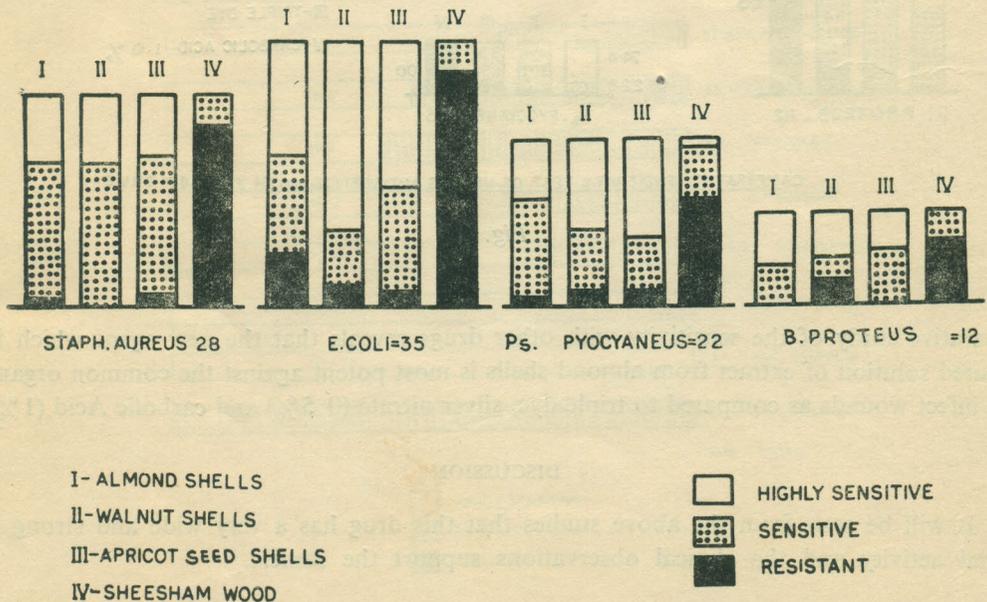


Fig. 3

From the above figure it is clear that the antibacterial activity is present in substances extracted from almond shells, walnut shells, and apricot seed shells while very little antibacterial activity is present in substances extracted from sheesham wood. This confirms the belief that nature has provided an antibacterial and antifungal agent in the shells of seeds and that this substance can be used in human beings in the control of infection provided it is not toxic to the tissues or the internal organs when absorbed.

There are certain characteristics which are required in a perfect topical antibacterial agent. These are :—

- (i) Wide spectrum of antibacterial activity effective against major pathogens.
- (ii) Resistant strains should not develop.
- (iii) It should be able to actively diffuse an effective concentration into the local tissues.
- (iv) Lack of local and systemic toxicity.
- (v) It must not kill viable tissue cells in the wound nor interfere with proliferation of epidermis or 'takes' of skin grafts.
- (vi) The antibacterial action must be prolonged.
- (vii) It should be readily available.

The above mentioned properties of an ideal drug have been applied to this drug and the observations are :—

This antibacterial agent has been used in over 170 patients of burn injuries and also in some septic wounds (unpublished data).

The first two properties have been seen by the observations and this drug has shown a very wide spectrum of antibacterial activity, it is effective against major pathogens especially *Ps. Pyocyanus*, and *B. Proteus* which are not easily controlled by most antibiotics and which cause very marked morbidity and mortality in burn wounds. By repeated culturing from the same wound after the use of this drug, resistant strains have not been detected.

No local toxicity has been noticed as very large areas of burn wounds have been dressed with this drug. However, when applied to raw wounds it does smart but the smarting disappears after an hour or so. The drug is now applied to the burn wounds over a layer of vaseline gauze and the smarting is much less as the drug diffuses into the wounds slowly and the dressings can be removed without injuring the granulation tissue. The clinical trials have not shown any systemic toxicity. Animal experimental study for toxicity is being carried out. The early observations show that it is comparatively a non-toxic drug.

The healing in superficial burns is so rapid and perfect that it seems that the drug does not destroy the epithelium rather it saves the epithelium from destruction by pathogenic organ-

isms. The skin grafts have taken well when wounds were dressed with this drug immediately after skin grafting.

It appears that this drug has a prolonged action as the dressings are changed on alternate days and sometimes even after longer intervals and yet there is no smell or pus.

This drug can be made readily available.

What is the active principle in this drug is yet to be found out.

SUMMARY

In short, a drug has been found which has been used by the author for controlling skin infections and for which a plausible explanation has been thought of. The preliminary clinical trials and bacteriological studies have given encouraging results. A lot of work is still required to be done. This is only a preliminary report.

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