

Nonconventional Power Sources. [1]Part-II: Study on Azadirachta indica Leaves as Nonconventional Bio-Electrochemical Low Power Sources: A Novelty^Ψ

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ABSTRACT

Efforts were made to correlate the properties of the plant leaves and its Bio-electrochemistry has been focused for the development of nonconventional bio-electrical energy resources. This property can be used for micropower electronic devices which are also termed as bio-emf-devices. The important characteristics of the Bio electro devices (BED) using the leaves of selected plant from the family, Meliaceae, viz. Azadirachta indica L is under detail study. The qualitative aspects of the leaves to develop non-conventional bio-electrochemical low power sources will be attempted. The obtained qualitative result will be used to study various possible involvement of bio-activities in the operational mechanism of bio-emf-devices.

INTRODUCTION :

The plant parts like leaves etc. are natural biosystems which contain different inorganic and organic ions[2]. The controlled and regulated ionic motion makes the biosystem different than a usual physical electrolytic system. Thus the plant parts may be defined as "Bio electrolytic systems" or "Bio-power conducting systems". As a good ionic conductor[3] is a prerequisite condition for a battery material. We thought of exploring the possibility of using the plant leaves as new nonconventional material for developing low-power sources for micro-electronic devices i.e the small technological appliance.

Literature survey, shows that variations of pH in the case of hydrilla-verticiliata has been correlated with the time as variant [4]. Recent, report[5] shows that the leaves can be used to generate electrical power practically. Also in a "University Research Festival-Avishkar-2009" reported[6] the study of plant leaves extracts of Vinca rosea as non-conventional bio-electrochemical low power source. Very recently, Rane[7] and Patil et. al.[8] has studied the potential of two plants viz. Moringa olerefera (as bitter in taste) from family, Moringaceae and the other Rumex vesicarius L (as sour source) from family Polygonaceae for their bio-electrode potential behaviour. In this research paper, the results on the characterisation and development of Bio-electro devices using leaves of the selected plant viz. family,

Meliaceae, viz. *Azadirachta indica* L are in progress and presented. The potential variations with the time and temperature for bioelectro devices of biofluid have been studied. The results showed the involvement of bioelectro-chemical properties of studied plant leaves in the operation of bio electro devices.

EXPERIMENTAL :

Cell is constructed containing various electrodes (viz. copper and zinc) is prepared using metallic plates. The used electrodes were washed, cleaned, well polished and at the end cleaned by distilled water several times, before employing them for the experiment. The plant leaves extract is filled in the cell and variations of potential were recorded as a function of time. In the experimental setup(given in Notes) multimeter is used to measure the potential, for this work.

Variation of Potential with Time :

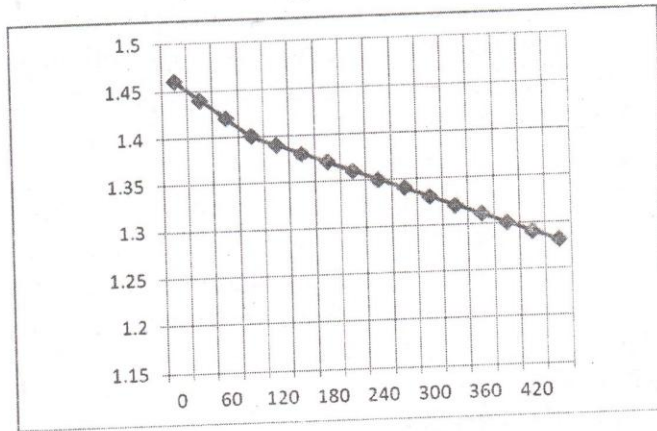
The results of bio electro devices under open circuit condition for potential variations at 32°C are shown in Fig. I for biofluids of plant leaves from family, Meliaceae, viz. *Azadirachta indica* L.

Table-I: The results of bio electro-device (under open circuit condition) for potential and time for biofluids of *Azadirachta indica* L from family Meliaceae.

Sr. No.	Time in Min.	Potential in V
1	0	1.46
2	30	1.44
3	60	1.42
4	90	1.40
5	120	1.39
6	150	1.38
7	180	1.37
8	210	1.36
9	240	1.35
10	270	1.34
11	300	1.33
12	330	1.32
13	360	1.31
14	390	1.30
15	420	1.29
16	450	1.28

The bio electro devices gave the initial value is 1.46 V (at 32°C) which changed with time and decreased slowly. It have been noted that its value is even larger than the initial value

—Potential in Volts?



— Time in min. ?

Fig. I. Variation of potential with time period of bio electro devices for *Azadirachta indica* L (under open circuit condition).

in case of some plants. So, it is difficult here to appeal the electrochemical principles [9] to evaluate value theoretically. These variations are possibly bio-originated. These observations thus indicate about an involvement of a large number of energy producing bioelectro-chemical reactions in the operation of bio electro devices.

Variation of Potential with Temperature :

The results of bio electro devices under open circuit condition for potential (1.45, 1.46, 1.48 V) variations with temperature 27, 32 and 37°C. for initial values are shown in Fig. II for biofluids of plant leaves from family, Meliaceae, viz. *Azadirachta indica* L.

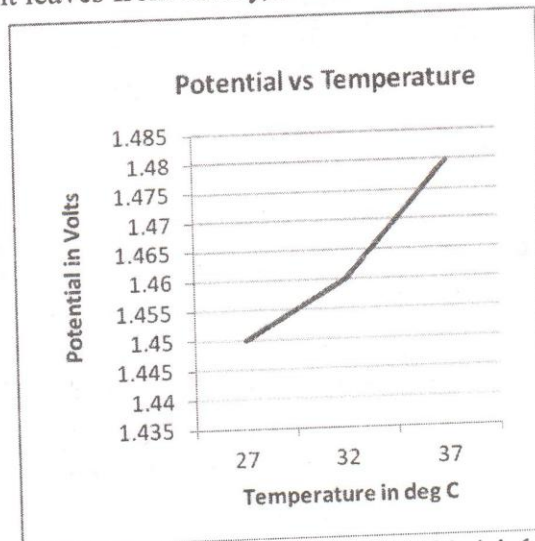


Fig. II. Variation of potential with temperature of initial values for bio electro devices for *Azadirachta indica* L (under open circuit condition).



CONCLUSION:

Even if the operational mechanism of bio electro devices is yet to be investigated very clearly, its prospective use to energizing micro-electronics.

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REFERENCES:

- 1) Manisha C. Patil, M. N. Lidhure and C. J. Patil, Part-I of this series (communicated to Int. J. Herbal and Green Chemistry).
- 2) S. C. Oatta, Plant Physiology, Allahabad (1980) 182-185.
- 3) K. Lehovec and J. Border, J. Electrochem. Soc., 101 (1954) 208.
- 4) K. S. A. Gnanasekaran and R. Rajasekar, **Bull. Electrochem.**, 2 (1986) 153.
- 5) K. M. Jain, P. Singh and A. Singh, Asian J. Expt. Sci., 1 (1986) 44.
- 6) Manisha Patil, M. N. Lidhure and C. J. Patil, In Avishkar, University Research Festival-2009, 1-2nd Dec. 2009.
- 7) V. N. Rane, In Avishkar, University Research Festival-2012, 13-14th Dec. 2012.
- 8) C. J. Patil, Hemant A. Mahajan, S. B. Salve, Vivek N. Rane and Manisha C. Patil, J. Res. Dev., (Communicated-2013).
- 9) W. Gensler, J. Electrochem. Soc., 127 (1980) 2365.

Note: The construction of the experimental set-up for the present work.