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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 6 (7): 686-687, 2003
ISSN 1028-8880

Identification of *Micrococcus* sp. Responsible for the Accelaration of Jute Retting

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Abstract: Attempt was under taken to isolate, identify and characterized jute retting bacteria from the natural environment. Among all the isolate, *Micrococcus* sp. was found to be the most promising microbe which retted jute only within 6 days under control laboratory condition.

Key words: Jute, retting, identification, *Micrococcus* sp.

Introduction

Jute is a product oriented commercial fibre obtained from the outer part of a jute plant. Jute (*Corchorus capsularis* and *C. olitorius*), Kenaf (*Hibiscus canabinus*) and Roselle/Mesta (*Hibiscus sabdariffa*) constitute very important fibre and cash crops of the world (Ali, 1990 and 1992). Total global production, about 3 million tons, of jute/kenaf, are harvested per ha. As a commodity, Jute is facing competition on two fronts. On the one hand, jute so facing stiff competition from synthetics at the consumer's end, while on the other, from more remunerative crops at the grower's end. Therefore, in some consuming countries the market for jute is declining and in some producing countries the acreage under jute is declining. In order to face the dual challenge confronting jute both at consumers' end and at the producers' end, we have to adopted a strategy which consists of agricultural research and development, industrial research and development and market promotion of both traditional and diversified jute products (Ali, 1992; Ahmed, 1963).

The process of separation and extraction of fibres from non-fibrous tissues and woody part of the stem through dissolution and decomposition of pectins, gums and other mucilaginous substances is called retting.

Generally, the bottom portion of the jute plant is thick and hard which takes a longer time for retting than the upper portion. Owing to over maturity, variety and improper retting, the bottom portions of these unretted bark materials are cut down in the jute mills and are known as cuttings (Ali, 1992). A large proportion of the total production of raw jute in Bangladesh is of very poor quality having 20-40% of cuttings (hard basal parts) in the bottom portions of the fibre. These fibres are low-grade jute, have less utility than normal jute and are not suitable for spinning. The quality of the fibres is largely determined by the efficiency of the retting process. In other words, retting is the process by which the pectic materials which bounds the fibres of the remainder of the stem is broken down and the fibres are liberated. Variation in fibre quality is dependent on retting. Specific enzymes secreted by the microorganisms first cause degrade the complex organic materials to simpler compounds which are then metabolized for their life processes. A series of biochemical reactions thus go on (Alam, 1970). Extraction of the fibre involves the decomposition of the cementing material by microbiological method or its dissolution by chemical method by which the fibre bundles are loosened from the adhering tissues and are removed by washing. In microbial retting, pectin and hemicellulose are decomposed to water-soluble compounds by specific enzymes secreted by the microorganisms present in water and in plant. In recent years, greater interest in the field of microbial retting has been focused on enzymatic retting. It has been observed that pectic enzymes hydrolyze the pectic substances cementing the fibre bundles of the fibre plants and as a result, the fibres loosened enough for mechanical separation and washing. Most of the pectic enzymes extracted so far are from bacterial culture but maintenance and extraction are expensive, laborious and are thus not so cost effective. On the contrary fungal culture can grow on low cost medium with shorter period of time than bacterial culture. The state of knowledge as to the properties of pectic enzymes is still in an imperfect stage and the activity, so far studies, of these bacterial enzymes are variable. The activity of pectic enzymes are much influenced by temperature and pH. It is proven fact that both anaerobes and aerobes can ret fibre plant (Ahmed, 1963; Alam, 1970).

Therefore, although much work has been done, yet the knowledge of bacterial retting, is still far from perfection and still much more knowledge should be acquire by further intensifying the researches on the isolation and identification of retting bacteria. So attempt was undertaken in present report to identify *Micrococcus* sp. and determination of its retting activity.

Materials and Methods

Samples were collected from jute plants retted under natural condition. Crystal violet agar (glucose 5.0 gm,

peptone 5.0 gm, L-cystine 0.2 gm, Crystal violet 10.0 gm, agar 20.0 gm per litre of distilled water) medium was used which showed best for cultivation of microorganisms. After cultivation, colonies were successfully isolated in nutrient broth (peptone 5.0 gm, beef extract 3.0 gm, Agar 20.0 gm, distilled water 1.0 litre).

For the detection of the retting ability of such bacteria, sterile jute-stem-tubes were prepared by introducing into test tubes pieces of jute stem 2½ in. in length and enough distilled water to just cover them, and then autoclaving. The tubes were inoculated separately with different pure aerobic bacterial isolate and these tubes were then left at room temperature for days to ascertain the ability of the bacteria to ret jute and were under daily observation to note the nature of change on the stem. If any stem in the inoculated tubes was found retted, that is, the pectins of the bark of the stem decomposed and the intervening tissue disintegrated, the bacteria concerned were taken as retters. For characterization, staining and physiological cultural study Bergey's manual of determinative bacteriology (Breed *et al.,* 1948) manual of methods for pure culture study of bacteria (Society of American Bacteriologists, 1948) were used as guides.

Results and Discussion

Of the different types of *Micrococci* isolated and tested for retting, one species namely *Micrococcus* sp. was found to ret jute stem in 6 days showed complete separation of fibre strands. Morphological and physiological characters of strains studied in details are given below:

Growth in deep-glucose agar …….…	No. surface growth colonies throughout the medium starting from 2 cm below the upper surface.
Agar slant……....	Echinulate.
Potato slant……....	Creamy, moderate growth, thick, echinulate.
Nutrient broth……....	Pellicle, slightly turbid, very slight sediment.
Litmus milk……..	Curdlet, buff, clear liquid and slight channels.
Vegetative cell……....	Occur singly or in chain of one, two or three; sometimes in conical form.
Milk agar plate……....	Not hydrolyzed.
Nitrates……....	Reduced.
Acetyl methyl carbinol……....	Positive.
Citrate……....	Utilized.
Urease…….….	Formed.
Indole……....	Not produced.
H_2S……....	Not formed
Coagulated egg albumine……....	Not proteolysed.
Synthetic medium……....	Not utilized.
Blood agar……....	Not haemolysed.
Brain medium……....	Utilized.
Cellulose……....	Not digested.
Growth at pH 6.0……....	Present.
Growth in alkaline pyrogallic acid…..	Scanty.
Action on jute stem……....	Retted jute in 6 days.

There is a little evidence on the record that aerobic bacteria take active part in the retting of jute and allied fibre plants (Ali *et al.,* 1972; Alam and Asaduzzaman, 1993; Haque *et al*., 1992). In the present study, the bacterium isolated was found to be most active which retted jute in 6 days under laboratory condition. But most of the aerobic bacteria used in the retting of jute and allied fibre plants were found to be non retter or retted jute in long period of time (Ali, 1992; Ahmed, 1963; Alam, 1970). It is essential to note that the traditional process of retting of jute takes about 12-20 days at about 36-39°C. In conclusion, a bacterium, *Micrococcus* sp. was isolated from the retted jute fibres which was found to ret jute in 6 days under laboratory conditions at 37°C and this was not previously reported as retter of jute and any other fibre plants. Further study is necessary to isolate such aerobic bacteria which could be maintained and commercially used in the retting of jute producing quality fibre.

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