

FREE-HAND SECTIONING MACHINE INVENTED FOR ANATOMICAL STUDIES OF BIOLOGICAL MATERIALS

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ABSTRACT

This research was set to investigate an easier, faster, better and near-permanent sections made with advanced Free-Hand Sectioning Machine of tissues of Biological origin. The time of exposure using hazardous chemicals such as chloroform and xylene was considerably reduced to 5 to 30 minutes when compared to that of 2 to 3 hours in microtomy. The arrangement of 5 Razor Blades or more sets of such cross-sections, such that one vertical Nacet Blade lies in-between two horizontal Nacet Blades, serve as the heart of this machine, supported on both sides with two vertical sets of Tiger Blades, one on each reverse side. The material to be sectioned is placed through the hole immediately below the horizontal sets of blades, which are carefully pushed downward producing sections as thin as 5 to 15µm in thickness. The sections are pass through alcohol solutions of 30%, 50%, 70%, 95% and absolute alcohol for 10 minutes in each solution; and alcohol-chloroform series in the ratio of 3:1, 1:1, 1:3 and pure chloroform for 15 minutes in each series. The dehydrated sections were rehydrated in the same manner and stained with 50% alcohol with 1% Alcian blue for 5 minutes, rinsed with tap water and counterstained with 1% Safranin for 2 minutes, rinsed, dehydrated at 2 minutes in each solution and series, cleared in xylene and mounted with a drop of Canada Balsam previously mixed with xylene and a coverslip placed on it. The slides were dried in oven set at 30°C. Photomicrographs were taken from good preparations.

Keywords: Free-Hand, Sections, Blades, Biological, Materials.

SHORT COMMUNICATION

INTRODUCTION

Microtomy has always been the source of permanent slide preparation of biological materials. According to Johanson (1940), the sections are made to pass through alcohol solutions of 30%, 50%, 70%, 95% and absolute for 3 hours in each, and then

through alcohol- chloroform series of 3:1, 1:1, 1:3 ad pure chloroform for 2 hours in each respectively. The use of the microtome is excellent, it is used across board whether soft or hard tissues alike. The recent invention on use of 5 razor blades as described by Wahua (2013) stands out as advancement over use of other free hand sectioning methods involving the use of

razor blades. The sections are more uniform in thickness, clearer and near permanent slides for the former than the temporary sections from the latter.

MATERIALS AND METHODS

The materials and methods applied is according to the arrangement of 5 razor blades or more set of the cross section of these blades, such that one Central Nacet Blade in-between two Nacet Blades serves as the heart of this machine, supported on both sides with two vertical set of Tiger Blades, one on each reverse side in consonance to the central one. Plant material to be sectioned is placed through the hole lying immediately below the horizontally set edge cutting Nacet blades which are pushed downward in synchrony such that sections as thin as 10 to 15 μ m are made. This is made to pass through alcohol

solutions of 30%, 50%, 70%, 95% and absolute for 10 minutes in each solution; and through alcohol-chloroform series in the ratio of 3:1, 1:1, 1:3 and pure chloroform for 15minutes in each series. The dehydrated sections are rehydrated in the same manner and at 50% alcohol stained with 1% Alcian for 5 minutes, rinsed with tap water and counterstained with 1% Safranin for 2 minutes, rinsed and dehydrated using 50%, 70%, 95% and absolute alcohol, and then 3:1, 1:1, 1:3, cleared in xylene, at 2 minutes in each, wipe off excess xylene and mounted with a drop of Canada Balsam previously mixed with xylene on a glass slide and covered gently with a coverslip and placed in the oven set at 30⁰ to 45⁰C for drying. Photomicrographs were taken from good preparations.

RESULT

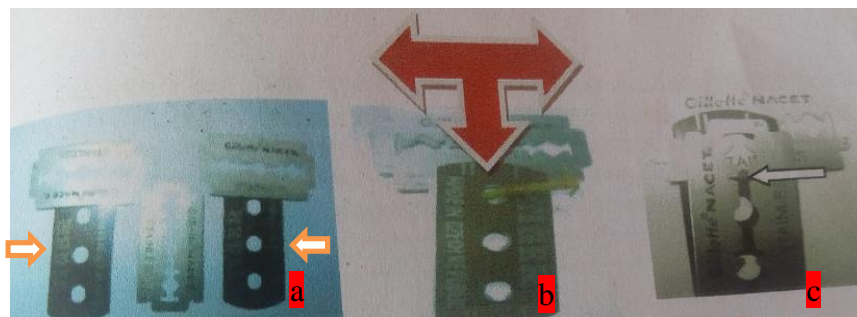


Plate 1 : Wahua's Free-Hand Sectioning Machine

In Plate 1a, the Central Nacet Blade determines the thickness of the sections. The white arrows revealed the crossed section of two blades lying on either sides of the central one, in a way that the Nacet blades lie inward while the Tiger Blades outward. The Nacets in horizontal position are for sectioning of tissues of Biological materials. Hard tissues are softened by boiling

in water or kept in absolute alcohol and glycerine in the ratio of 1:1 for 2 days or more before sectioning. The whole system is set up as shown in Plate 1b. The white arrow in Plate 1c revealed the section made with aid of the horizontal Nacet blades.

Some of the photomicrographs taken from good preparations made from Wahua's

free-Hand Sectioning machine are shown below:

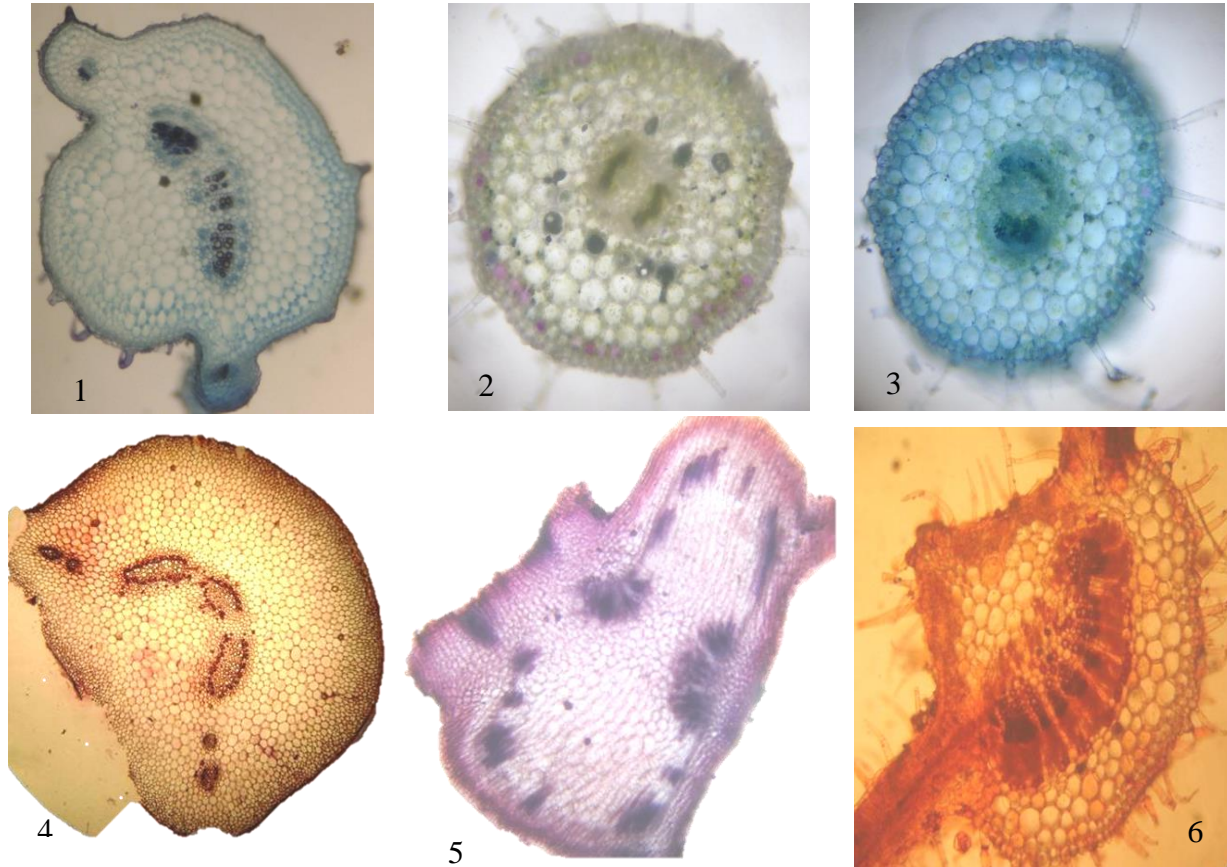


Plate 1: *Solanum nigrum* petiole T.S.

Plate 2: *Capsicum frutescens* Linn. Stem T.S.

Plate 3: *Solanum aethiopicum* Linn. Stem T.S.

Plate 4: *Solanum macrocarpon* Linn. Petiole T.S.

Plate 5: *Physalis angulate* Linn. Nodal T.S.

Plate 6: *Solanum nigrum* Linn. Mid-rib T.S.

The plates are all found in Wahua (2013). Plate 1 and 6 were published in Wahua *et al.* (2013) while plate 4 is in Wahua *et al.* (2016). These few examples serve as representative samples to the lots of publications made using Wahua's Free-Hand Sectioning Machine.

DISCUSSION

There have been other forms of free hand sectioning instruments in the Biological Sciences based on the concept of making temporary slides with some setbacks in terms of uniformity in thickness of sections and as a result, most of the photomicrographs generated do not give very clear background pictures when compared with the better precisions of

Wahua's Free-Hand Sectioning Machine. It has more even or uniform thickness and a near permanent slide as in conformity with the description given by Wahua (2013) and Wahua *et al.* (2013).

CONCLUSION

In terms of exposition with hazardous chemicals, Wahua's Free-Hand Sectioning Machine stands out with shorter time duration when compared with microtomy though the use of microtomes in biological sections is excellent, presently, the best precision in every aspect of anatomical sections and slide preparations.

RECOMMENDATION

Efforts are put to providing the electric version of the Wahua's Free-Hand Sectioning Machine and improvement on a special blade able to handle both soft and hard sections of biological materials.

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