A Geometric Description of the Peritechia of the *Pseudonectria rousseliana* (Mont.) Wollenw

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ABSTRACT

In this study, a geometric and experimental analysis of the peritechia of *Pseudonectria rousseliana* (Mont.) Wollenw was presented. Experimentally, longitudinal length ($|AB|$) and the body ($|CD|$) of peritechia were measured. Geometrically, it was shown that the peritechia is comparable with a surface of revolution of a profile curve. On the same regions of the modelled surface the diameters of the horizontal sections was measured. It was found that the geometric and the experimental values were closely related.

Key Words: *Pseudonectria rousseliana* –Twig and leaf blight- Peritechia - Surface of revolution.

INTRODUCTION

Pseudonectria rousseliana (Mont.) Wollenw. is frequently associated with cancers and diebacks of forest, timber, fruits and ornamental trees and shrubs, they behave in general as wound pathogens. Symptoms appear as woody galls of different sizes on the leaves, twigs, and trunk. This fungus has a wide host range on woody plants but appears to be primarily a wound invader on edible fig (*Buxus sempervirens)* (Alfieri 1984). Galls develop at leaf axils, pruning scars, or sites of mechanical damage to trunks or limbs. Stem cankers may occur on some cultivars. *Pseudonectria rousseliana* state can be found in diseased tissue, which appears corky and callused. Look for galls or cankers on stems, at cut ends of stems, and at leaf axils where abscission has occurred (Holiday 1980, David 1995). The peritechia of *Pseudonectria rousseliana* clustered, globose or subglobose, with a flat apical disc, often collapsing when dry and then appearing cup-shaped, at first dark-red then red-chestnut. Peritechia often present on the surface and in crevices of the callus tissues and can be seen with a 10 x hand lens, photographed Leica DME microscope, measurement made Leica DFL320-camera IM measurement program was used.

Smith et al. (1999) identified the inner surface bladder and digitized from spiral computed tomography (CT) images. The data were cantered to a cylindrical coordinate system and mapped to the θ, z plane. This produced a spatially homogenous data distribution for surface fitting and reduced the necessary number of fit coordinates required to reproduce the bladder surface to one: the radial coordinate.

In Ezentas et. al. (2005) present a geometric description of the urinary bladder of a dog. They have shown that the urinary bladder is comparable with a surface of revolution of a planar (profile) curve.

The aim of this study is to compare the experimental work with the geometric of the peritechia of *Pseudonectria rousseliana*, twig and leaf blight.

MATERIALS AND METHODS

Experimental work

The study material *Buxus sempervirens* was collected from Uludağ mountain, in 2006. Identification were made up using the case of (Kirk 2001).

In this study, peritechia was modeled. Measurements of the peritechia was made with Leica DME microscope, digital caliper and photography was done with a Leica camera and IM 50 measure program. The longitudinal length ($|AB|$) and the body ($|CD|$) of peritechia were measured. (Fig. 1 and Table 1).
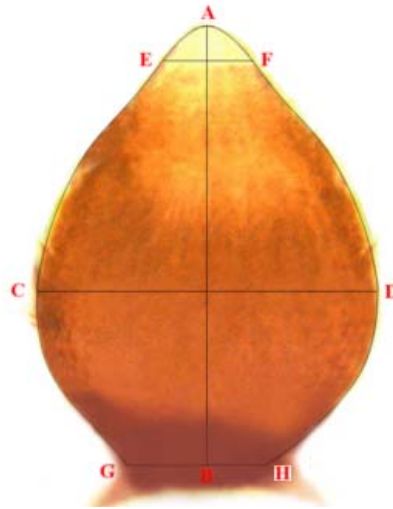
Figure 1. The Peritechia of *Pseudonectria rousseliana* (Mont.) Wollenw.

Herbarium material are deposited in Uludağ University Herbarium (BULU) and in the personal collection of Hasan Akgül.

Geometric work

For a differentiable real-valued function g on R^3, and a real number c the set S: $g(x, y, z) = c$ of R^3 is a *surface* if the differential dg is not zero at any point of S (Gray 1993).

Let γ: f(y, z) = c be a curve (*profile curve)* in the coordinate plane yz. If γ is revolved around the z-axis we obtain a *surface of revolution* S in R^3 defined by

(1) $$g(x, y, z) = f(\sqrt{x^2 + y^2}, z).$$

The circles in S generated, under revolution, by each point of γ are called *parallels* of S, the different positions of γ as it is rotated are called the *meridians* of S (Smith et al. 1999).

RESULTS

Experimental work

Experimentally, the body ($|CD|$), and the longitudinal length $|AB|$ of the peritechia were measured (Table 1).

Table 1. Geometric and Experimental values of the horizontal and vertical sections of the peritechia

Parts	Geometric values (b)	Experimental values (a)
Body : $|CD|$	0.55 units	151.16 μm
Longitudinal length: $|AB|$	0.86 units	251.87 μm
Ratio $\dfrac{|CD|}{|AB|}$	0.63 unit	0.60 μm

Geometric work

In the sequel we construct a surface of revolution peritechia by revolving of a plane curve γ:f(y, z) = c around the coordinate z-axis.

Consider the plane curve

(2) $$γ:f(y, z) = (-y^2+z^3)^3-(y^2+z^2+1)^3=-10$$

in the coordinate plane yz. We plot the graph of this curve (Fig. 2) by the use of maple X plotting command;

(3) implicitplot((-y^2+z^3)^3-(y^2+z^2+1)^3=-10,
y=-2..2,z=-1.3..1.3);

If we revolve the *profile curve* γ around the z-axis, it sweeps out a *surface of revolution* S in R^3 defined by
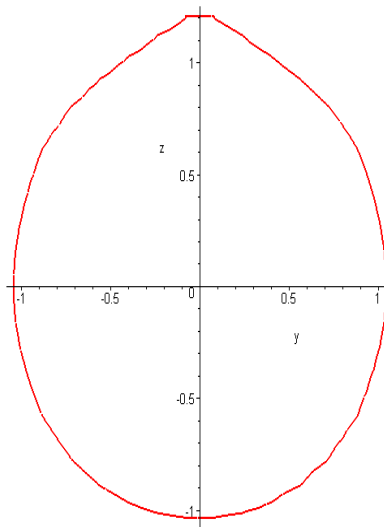
(4) $g(x, y, z) = f(\sqrt{x^2 + y^2}, z)$
=(-x^2 – y^2 + z^3)^3 –(x^2 + y^2 + z^2+ 1)^3=-10.

We plot the graph of this surface by the use of maple X plotting command;
(5) implicitplot3d((-x^2 - y^2 + z^3)^3-(x^2 + y^2 +
z^2+1)^3=-10,x=-2..2,y=-2..2,
z=-1.3..1.3,grid=[30,30,30]);

Figure 2. The profile curve γ of the ruled surface.

and we obtain the following figures of the ruled surface (Fig. 3).The geometrical values of the diameters of the horizontal sections the body (|CD|) and the longitudinal length |AB| of surface S was measured from Fig. 1, (Table 1).
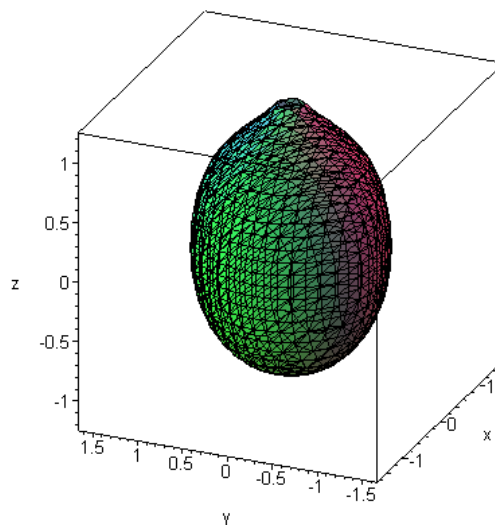
Figure 3. The muscular coats composed of three layers of (Peritechia) surface.

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The ratios $\dfrac{|CD|}{|AB|}$ of experimental values with geometric values were given in the Table 1.

DISCUSSION

Smith et. al. (1999) identified the inner surface and digitized from spiral computed tomography (CT) images. The data was centered to a cylindrical coordinate system and mapped to the θ, z plane. They claim that this produced a spatially homogenous data distribution for surface fitting and reduced the necessary number of fit coordinates required to reproduce the peritechia surface to one: the radial coordinate.

In this study, we present a geometric description of the peritechia of Pseudonectria rousseliana (Mont.) Wollenw**.** We consider the peritechia is an implicit surface and plot the graph of the peritechia surface of peritechia using the plotting command of maple X. Hence we contribute to the study of Smith et. al. (1999) showing that the peritechia is comparable with a surface of revolution of a planar (profile) curve.

Experimentally, the body and the longitudinal length of peritechia was measured. On the same regions the geometric values were taken from the modeled surface. It was found that the geometric and the experimental values were closely related. In conclusion the ratio $\dfrac{a}{b}$ of the experimental value (a) was close to the geometric value (b) of the peritechia surface. Therefore the peritechia was modeled with a surface of revolution of a plane curve **γ** given by the equation (4).

It is emphasized that an advantage of this method is that given a profile curve it is possible to find a surface of revolution. This method is useful for the modeling of undeformed symmetric surface. But for the case of a deformed surface we may need to define the deformation of the surface.

In conclusion, it was found that the geometric and the experimental values were closely related.

We hope that the present study will conform a basis for surface modeling. In future work we would like to apply these methods more thoroughly to segmentation and surface analysis. particular we would like to further investigate the surface.

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