# Detecting Proteolytic Degradation of Wheat by Insects Method

## Scope

- Detect proteolytic degradation caused by insects in wheat.

## Rapid Visco Analyser


The Rapid Visco Analyser (RVA) is a cooking stirring viscometer with ramped temperature and variable shear profiles optimized for testing viscous properties. The instrument includes international standard methods as well as full flexibility for customer tailor-made profiles. Combining speed, precision, flexibility and automation, the RVA is a unique tool for product development, quality and process control and quality assurance.

## Description

Insect damage of wheat grains results in reduced flour quality, which leads to weak doughs, breads of low volume and poor texture. The insect injects its saliva into the grain and lay eggs that hatch and develop *in vivo*, often leaving no visible external damage. The saliva secretion contains mainly protease enzymes (endopeptidases) that hydrolyse prolamins and glutenins, breaking peptide bonds. Other minor enzymes include α- and β-amylases that degrade starch, and lipases that hydrolyse triglycerides, causing rancidity (Barrigón, 2004).

The two common tests for insect damage include meticulous visual inspection of the external surface of the grain, and rheological characterization of the functional properties of wheat flours using the Alveograph. These methods either require skilled knowledge or are tedious and time consuming.

This method is based on the work of Barrigón (2004), who used the RVA to rapidly differentiate sound and insect-damaged wheat samples.

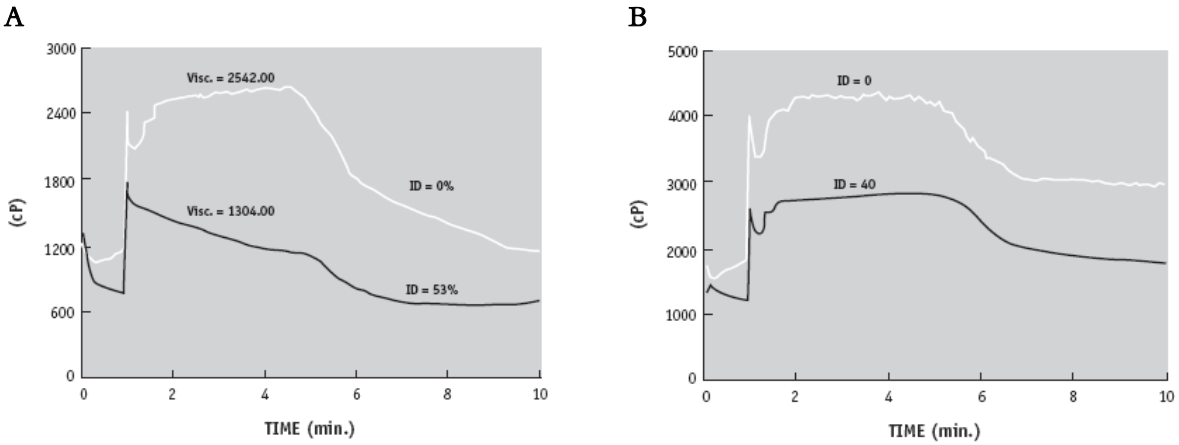


Fig. 1. Effect of proteolytic degradation in (A) vitreous and (B) soft wheat. White curves - no insect damage (ID), black curves - insect damage at 40% and 53%). Source: Barrigón (2005).

## Method
Method as described in Barrigón (2004), using a ten-minute profile.

## Sample Preparation
10.00 ± 0.01 g wholemeal sample (12% mb), 10.0 ml distilled water. Cover with rubber stopper and shake vigorously for 10 s. Add 2.0 ml 0.5 M lactic acid.

## Profile

| Time | Type | Value |
|---|---|---|
| 00:00:00 | Temp | 25°C |
| 00:00:00 | Speed | 1000 rpm |
| 00:01:00 | Speed | 160 rpm |
| 00:05:00 | Temp | 25°C |
| 00:07:00 | Temp | 50°C |
| 00:10:00 | End | |
| Idle Temperature: 25 ± 1°C<br>Time Between Readings: 4 s | | |

## Measure
V30: Viscosity at 30°C
FV: Final viscosity (cP)

BD: Breakdown [100(V30 – FV)/V30]

The breakdown is the drop in viscosity from V30 to final viscosity, expressed as a percentage of V30. Samples that have suffered insect damage generally show lower overall viscosities (ie. lower V30 and FV) and higher breakdowns.

## Reference
Barrigón, A.C. 2004. Detección rápida por RVA de la degradación proteolítica causada por insectos (*Aelia* y *Eurygaster*) en trigos blandos panificables. Alimentación Equipos y Tecnologia, Harinas y Derivadoes, Noviembre 2004, 37-43. (Spanish)

Barrigón, A.C. 2005. Rapid detection by RVA of proteolytic degradation caused by insects (*Aelia* and *Eurygaster*) in soft wheats used for bread making. Newport Scientific World 5:1-3.