Gabriel Data Analysis (GDA): from data analysis to food analysis

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GDA is a software belonging to the Gabriel package and is devoted to data analysis. Year after year some new features have been introduced and the latest introductions are more dedicated to food. GDA is built around modules and we describe here the most widely used in food chemistry.

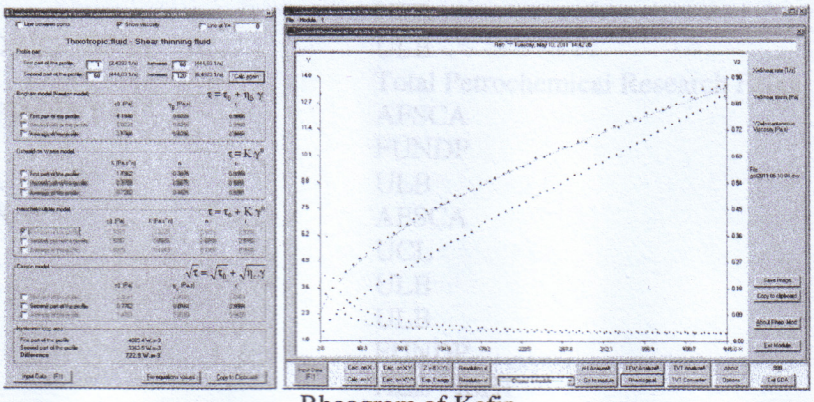
Input Module
This is the first one and the most important module of GDA with which the user could either enter the data, load data directly from apparatus file in particular the TVT files from Lauda TVT 1 Tensiometer or the DVW files from Bohlin CVO120.

One Variable Statistic Module
Here, GDA computes the sums of data, several averages, the dispersion of the data and a Student Fisher analysis with the possibility of testing a Null hypothesis. This module is widely used for example when a new method is developed. Recently, it was used for the study of the influence of the initial water content in the synthesis of fructose (derived from chicory) laurate catalyzed by lipase B of *Candida antarctica*.

Two Variables Statistic Module
This module is the biggest part of GDA and one of the reasons of GDA: the use of Microsoft Excel® is not easy to find the best correlations of data. In that respect, this module uses two windows: the graphical windows and the equation panel windows needed because of the important number of equations (more than 20). In the same study as above (influence of the initial water content), this module was used to find the correlation between the conversion rate of the lauric acid and the initial water content: the direct esterification follows a three-parameter power law while the transesterification follows an exponential law.

Rheological Module
The rheology of food is very important during the process but also for the consumers. In GDA, the most popular rheological models (Newton, Bingham, Ostwald-de Waele, Herschel-Bulkley and Casson) have been implemented and from the panel the best model can be found easily and the food behavior can be predicted. GDA was used for modeling the consistency of yogurt in the mouth.

Surface tension Module
Surfactants are frequently used in food or cosmetic industry. In food chemistry, those compounds have very good emulsifying, stabilizing or conditioning effects. On this subject, the case of mayonnaise is the best known example. One property that characterizes the surfactant is the surface tension. The module can search directly the equilibrium surface tension at infinity and was used to determine which part in the egg yolk is responsible of the surfactant properties. The determination of the surface tension of the fructose laurate was also performed with this module.



Rheogram of Kefir

Other modules are already implemented like pH analysis, Langmuir balance analysis, Arrhenius/Eyring energy determination as can be see in the image above. GDA can be obtained free of charge upon request.

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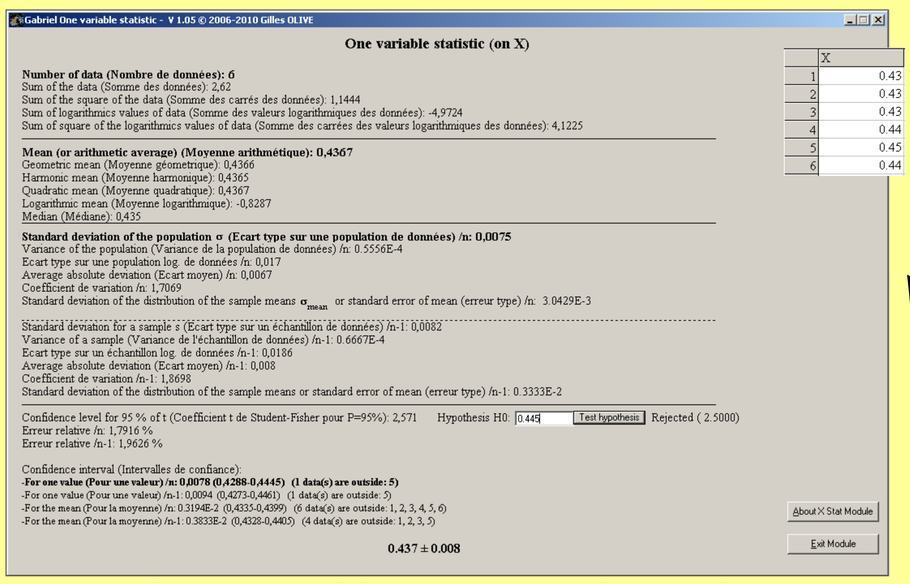
Gabriel Data Analysis (GDA) is a software devoted to data analysis. GDA is built around modules, some of which are more dedicated to food chemsitry and programmed in this way. We present here some results in food chemistry obtained with a few modules only. Other modules are already implemented as can be seen in the image below.

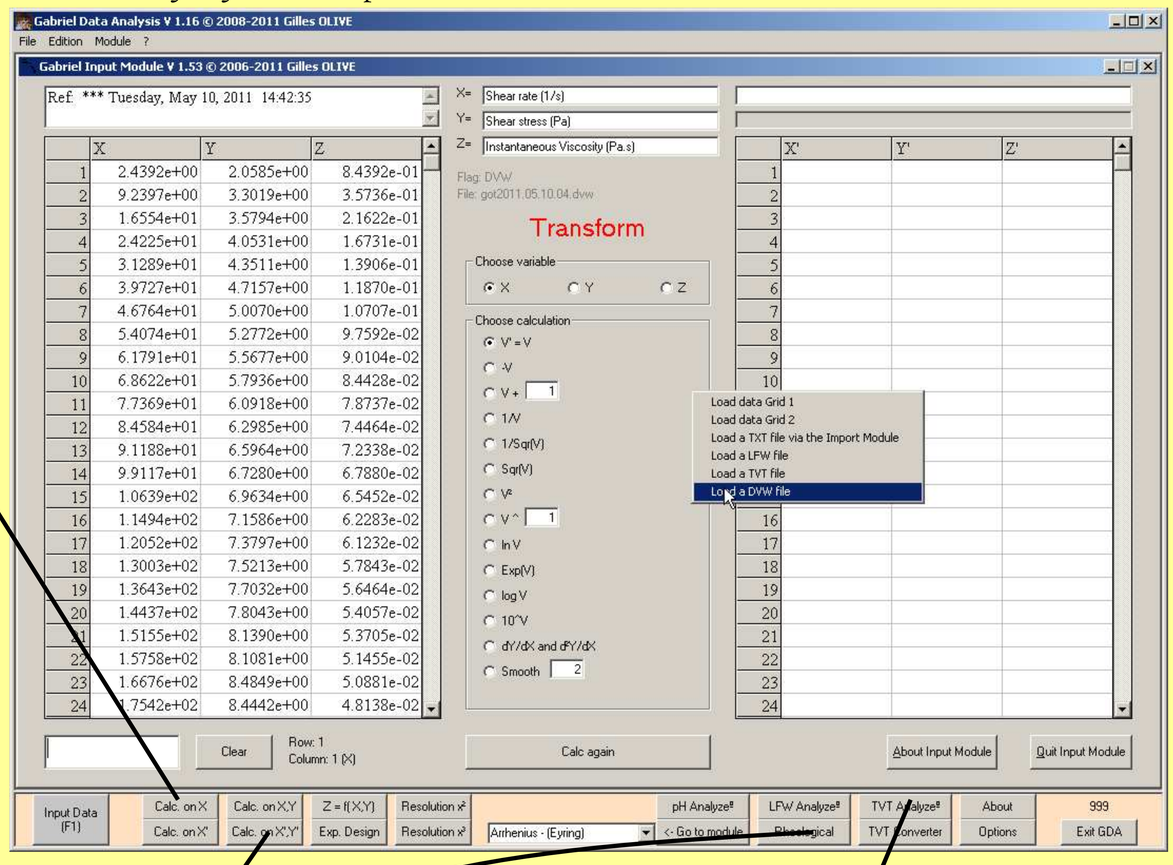
GDA can be obtained free of charge upon request.

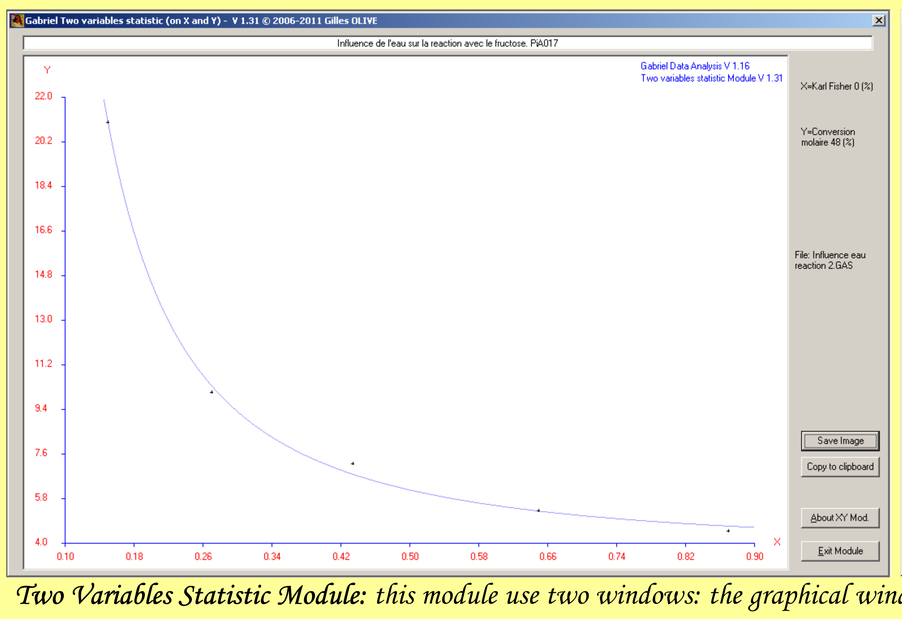


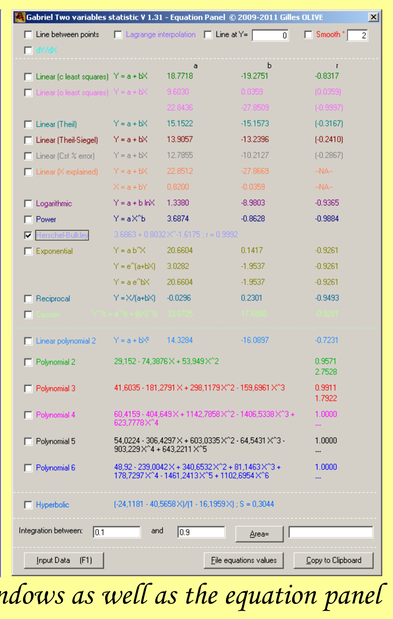
One Variable Statistic Module: *GDA computes the sums of data, several averages, the dispersion of the data and a Student Fisher analysis with the possibilty of testing a Null hypothesis.*

Here you can find the analysis of the determination of water (when 150 µl are added) in the study of the influence of initial water content during the synthesis of fructose (derived from chicory) laurate catalyzed by lipase B from Candida antarctica.

Input Module: *here the user could either enter the data, or load data directly from apparatus file in particular TVT files from Lauda TVT 1 Tensiometer, LFW files from Lauda FW 2 Langmuir-Balance or the DVW files from Bohlin CVO120. The authors are attentive to the user's wishes and are ready to introduce new files format to help users.*

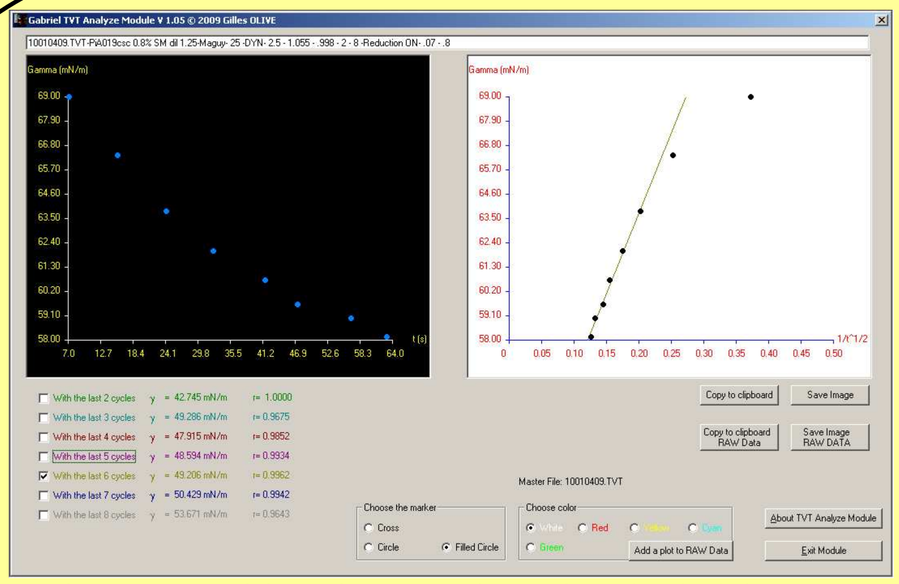






Two Variables Statistic Module: *this module use two windows: the graphical windows as well as the equation panel windows are needed because of the important number of equations (more than 20).*

In the same study presented in the One Variable Statistic Module (influence of the initial water content during the synthesis of fructose laurate catalyzed by lipase B from Candida antarctica), this module was used to find the correlation between the conversion rate of the lauric acid and the initial water content: the direct esterification follows a three-parameter power law (in our case Conversion(%) = 3,68625 + 0,80315.InitialWaterContent$^{-1,61746}$; r = -0,9992) while the transesterification follows an exponential law (data not shown).



Surface tension Module: *Surfactants are frequently used in food chemistry. One properties that characterizes the surfactant is the surface tension. The module can search directly the equilibrium surface tension at infinity.*

The determination of the surface tension of the fructose dilaurate was performed with this module as can be seen above.

Rheological Module: *The rheology of food is important during the process but also for the consumers. As can be seen, GDA includes the most classical rheological models (Newton, Bingham, Ostwald-de Waele, Herschel-Bulkley and Casson) and from the panel the best model is easily found.*

GDA was used for modeling the rheological behavior of the kefir in the mouth (see figure).

The reader will remark that every part of the rheogram can be modeled independently. He can also see that the second part of the profile can be modeled by two model, the Herschel-Bulkley model suitable at high shear rate while the Casson model is better for low shear rate.