

# FRUIT GROWING

# VINE GROWING

Extract from the  
Journal of the advisory circle of South Tyrol  
Andreas-Hofer-Straße 9 • I-39011 Lana



A reliable partner of fruit and vine growers since 4 decades

July, August 1998 - Volume 35 - Number 7/8

# Measurability of the Biological Quality of Apples by means of the P-value with Reference to Different Fertilizers

Herbert KEPPEL, Landwirtschaftliches Versuchszentrum Steiermark, Haidegg (agricultural research centre of Styria, Haidegg/Austria)

The measurement of the P-value is a new method for determining the inner quality; conclusions can be drawn from the thermodynamic factor of this measurement on the biological quality of food. The P-value is an objective indicator of food quality and will offer - as a new quality parameter - an extended dimension of production management and quality control. As an example of these possibilities, the result of a comparative trial of fertilizers, carried out by the Landwirtschaftliche Versuchszentrum Steiermark, test station for fruit and vine growing in Haidegg in 1997, will be described in the following.

## Material and Method

**P-value:** this parameter is an abstract formula based on the pH value, the rH-value, and the electric resistance, measured in the liquid product phase.

The sample is disintegrated, centrifuged, and the individual parameters are determined from the juice. The P-value may also be defined as a stress factor, as trials carried out over many years have revealed that the biological quality of food is reduced with an increasing P-value (or if a stress-producing production method was used).

The P-value and its interpretation should help agriculture to accompany production processes and objectify their effect on the product.

**Sampling:** 3 samples of fruit were taken from each of 6 trees from the medium part of the fertilizer plot under identical test conditions and stored intermediately in the cold store.

**Trial issue:** is the P-value of apples changed when using different fertilizers?

**Trial setup:** Golden Delicious, Haidegg clone, rootstock M9, 6th year, 14 variants, 6-fold replicate (P-value).

### **Fertilizers under examination:**

- 2 = urea as foliar fertilizer
- 4 = foliar fertilizer Folifert
- 5 = foliar fertilizer no. 5
- 6 = foliar fertilizer no. 6
- 8 = Boron Nitramoncal
- 9 = seaweed-lime preparation
- 10 = control (mulch mass is left lying)
- 11 = mulch (on the planting rows)
- 12 = compost
- 13 = Vollkorn blau (mineral fertilizer)
- 14 = basement soil meal Biolit
- 15 = single fertilizer (NPK)
- 16 = Biosol (first applied in 1997)
- 17 = AgroBiosol (low-potassium, first applied in 1997)

## Discussion

The lowest P-values were found when applying the two fertilizers Biosol and AgroBiosol which do not interfere directly with the nutrient balance, but play an essential role in the development of soil organisms and stabilization of the soil structure. They differ significantly from all other fertilizers due to the low P-value, in the same way as fertilizer 15 (NPK single fertilizer), 14 (basement soil meal Biolit), and 13 (Vollkorn blau mineral fertilizer).

The lowest P-value with AgroBiosol can be explained by the fact that our soils have relatively high potassium contents due to fertilization, and an additional K-supply by fertilizers has a negative effect on the P-value, since K can change the electro-energetic conditions in fruit.

Based on the P-values obtained in the previous years and the conclusions drawn for the change of the application period of foliar fertilizers, foliar fertilizer Folifert achieved better (lower-stress) results. The result of the current year will reveal, if the P-value of the mulch variant (mulch mass placed on the planting rows) is increased due to the vegetation of the trial year or due to a starting nutrient deficiency. The clearly highest P-value is found in the control which has not been fertilized for 16 years (mulch is left lying on the tram line) (= stress due to nutrient deficiency). The relatively high P-values with Boron Nitramoncal indicate problems with B, as evidence has been found by means of a new soil analysis procedure revealing that excess quantities of B may be available in the soil, although the conventional test methods indicate a suboptimum B supply. Urea as foliar fertilizer is within the highest P-class and had the highest P-values (as in the previous years) together with two other foliar fertilizers.

A note is made that the soil improvement method "Solar" is used on this test plot for selective improvement of the soil structure.

## The P-value - a New Parameter for Quality Evaluation?

The term "quality" in its brevity can hardly describe all its dimensions. In food science, mainly the standards of quality classes, that is the description of external quality, are known as quality terms for the consumer. However, agricultural circles are beginning to extend the quality standards with the term "contents", which means that production is trying to determine the inner quality and develop a more comprehensive quality term.

Requirements for producers are high, as future payments for agricultural products will depend on the quality produced, but this will help the consumer and the producer; it will ensure that the two groups will receive adequate profits and quality for money. The major problem with regard to quality, as in agriculture in general, are profits on the basis of the world market price which lead to low income rates and no consideration of the inner (biological) quality.

An objective determination of the inner quality parameters by means of standardized laboratory tests (chemical analysis) is no problem, but the scientific requirement of reproducibility of the results presents difficulties, as the tested products are destroyed by the test method and are not available for a replicate under the same test conditions.

Electrochemistry offers a possibility of supplementing the chemical analysis and objectifying the quality criteria. It is a rapid method for revealing the "biological quality" of food. The determination of the P-value is an electrochemical method for determining the objective inner quality or "biological quality". Such tests have been carried out for more than 5 years at the Landwirtschaftliches Versuchszentrum Steiermark (agricultural research centre of Styria/Austria), trial station for fruit and vine growing in Haidegg. They have already become a standard laboratory procedure there and are supervised by the author of this article as a member of the international work group for electrochemical tests.

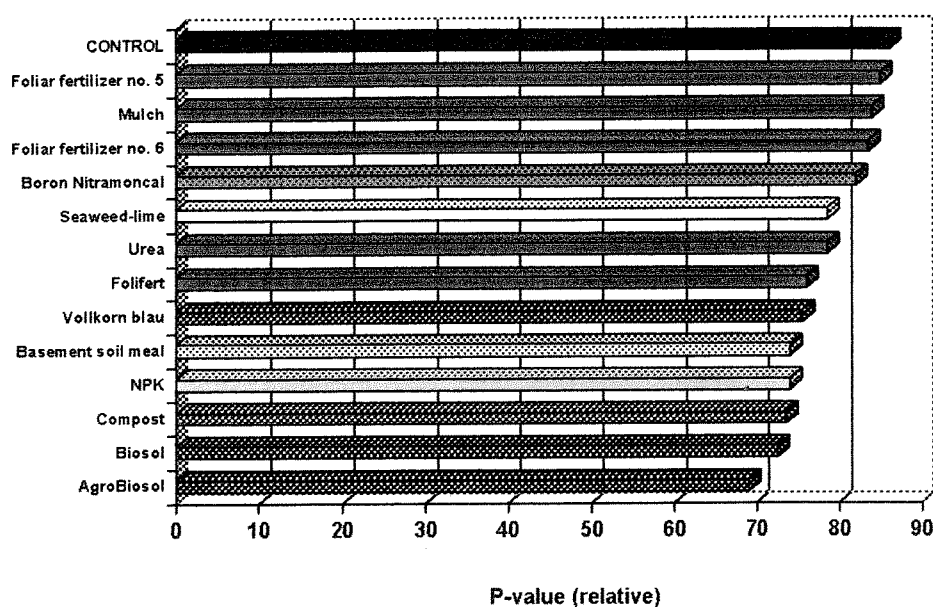
From this location, test results are available for the following:

in fruit growing, for example, apple rootstocks, comparisons of fertilizers and insecticides, comparison of fruit from conventional and biological production, energized water, decomposition behaviour of apple juice.

In vine growing, different vine rootstocks, different yeasts and wine varieties, and in vegetable growing, variety testing of field lettuce (Batavia types) and comparison of production methods for new tomato varieties. There are many relevant and accompanying parameters for the evaluation of the contents. However, the definition of inner quality is difficult. For the determination of the importance of inner quality, an objective evaluation of the “biological quality” is missing. This can be understood as the beneficial effect of food on the individual. Today it is considered as an established fact that the effects of different food qualities and types play an important role for the health standard of the population.

The establishment of quality management for agricultural products is therefore essential considering the globalization of the economy, the unrestricted exchange of goods, the increasing demands of the consumer, the increased health consciousness of the population, the extended food and luxury food selection, the comprehensive food designer trends, and the cost pressure on agricultural products.

Graph: **P-values with fertilizers 1997**



## The P-value as a Quality Standard

The P-value is obtained determining the values of the redox (oxidation-reduction) potential, the electric resistance, and the pH from the liquid product phase. From this, the P-value is calculated by means of a formula. This is also a product-specific stress indicator.

**The individual measurement parameters signify:**

**the pH value:** the proton activity (= usable energy drop),

**the redox potential:** the reduced capacity (migration readiness of electrons to neutralize free radicals),

**the electric resistance:** the electric conductivity (measure of cellular health).

