# Measurement of Holistic Quality Parameters of Pumpkins

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**Abstract**

Several kinds of pumpkins were investigated by the holistic method of single biophoton counting. The aim was to determine additional holistic quality parameters of the pumpkins related to their reap time. Intermediate results show tendencies in the differences of the biophoton emission of pumpkins cultivated in 6 different kinds (3 of them were organically and the other 3 traditionally cultured).

## Introduction

From biophysical point of view electromagnetic interaction is dominant in biological systems described as non-equilibrium thermodynamic organisation of biochemical matter. Therefore, living systems are emitting and absorbing electromagnetic fields whose quanta are called photons. This emission of light fields of biosystems is known as “biophoton emission”, sometimes called "low level bioluminescence" or "ultra weak bioluminescence".

Each living cell is producing a certain type of non-equilibrium, ultra weak photon emission for the aim of self-organisation the cell union. Since biophotons have physiological importance and implications, the emission intensity reflects the physiological state of cells respectively organisms. Thus biophoton counting opens up a new field of holistic food quality research in comparative studies. Growing processes and stress, for instance, change the emission of biophotons of certain wavelengths.

There is a close connection to delayed luminescence which corresponds to excited states of the coherent photon field. If excited states are kept longer, fewer photons are emitted due to hyperbolic relaxation function thus indicating high biophysical quality of a biosystem. Spontaneous biophoton emission and the connected photoluminescence which occurs after light irradiation have been applied to distinguish foods of different cultivation and processing systems.

**References:**

R. P. Feynman, QED – The strange theory of light and matter, Princeton University Press, Princeton 1985

B. Jezowska, B. Kochel, J. Slawinski, W. Strek (Eds.), Photon Emission From Biological Systems", World Scientific Publishing, Singapore 1987

K. H. Li, F. Popp, W. Nagl, H. Klima; Indications of Optical Coherence in Biological Systems and Its Possible Significance, in »Coherent Excitations in Biological Systems« (Ed. H. Fröhlich), Springer Verlag, Berlin 1983

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## Material

Ripe pumpkins of six different kinds were delivered from „Versuchsgarten Jedlersdorf“. Three of them 141,143,145 were organically and the other three 142,144,146 traditionally cultured. The samples were cutted in 5 mm slices with a diameter of 5 cm.



## Methods

The biophoton measuring arrangement consists of a photomultiplier tube **PM & K** (Hamamatsu R 943-02), a cooler **K** (Hamamatsu C 2761), an amplifier/discriminator **TTL** (C 3866 Hamamatsu), high voltage **HV** Tennelec TC 952 (1800 V), a PC measuring card (Oxford Tenelec Nucleus MCS) and the measuring software (MCS). Counting data are delivered in ASCII format and were processed by Origin, a standard software program.

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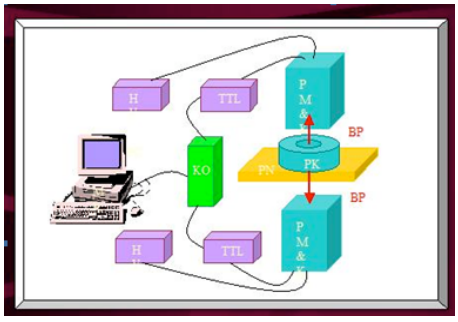
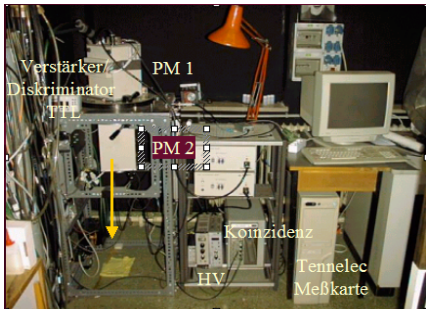


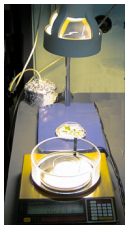

Sketch of the biophton measurement arrangement

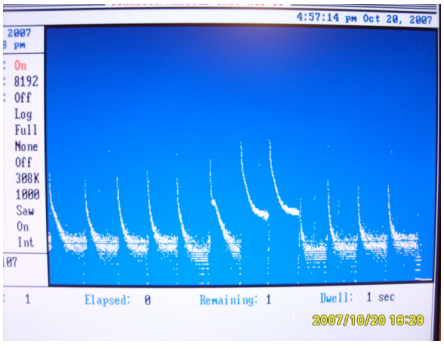



Picture of the biophton measurement arrangement

## Irradiation of the samples

Measuring glasses were filled with the sliced samples which were radiated with light of a standard lamp (80 Watt) in a distance of 35cm for 90 sec. Now the samples were given in the measuring chamber of the biophoton measuring arrangement and the measuring procedure was started 30 sec after irradiation.




## Results

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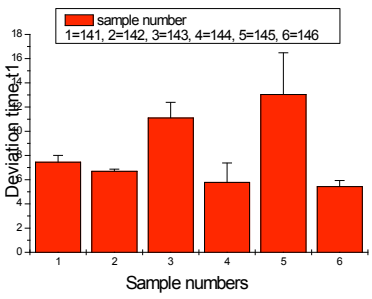
The single biophoton counting data of the several kinds of ripe pumpkins are showing a different deviation kinematics, as can be seen in the left picture. In order to quanify this kinematics the declining curves were normalized and additionally fitted by double exponential function

$$y = A1.\exp(-x/t1)+A2.\exp(-x/t2)$$

In the right side graphics the mean values of the t1 parameter can be seen, where the organic cultured samples 1,3,5 differ from the standard cultivated samples 2,4,6.

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