

– Projekt-Kurzbericht –

English Version

AIF-FV 13234 N

„Changes in the carbohydrate metabolism of coffee seeds during processing and storage of Arabica green coffee“

Promoting Institution: Forschungskreis der Ernährungsindustrie e.V. (FEI), Bonn

Research Institute: Institute of Plant Biology, Technical University, Braunschweig
(the former "Botanical Institute, TU Braunschweig")
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Industry: Deutscher Kaffeeverband
Project coordinator: Dr. Allan Bradbury, Kraft Foods, München

Timeframe of the project: 2002 - 2004

Allocation: 147.400- €
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Background

Green coffee can be stored only for a limited time period; even under optimal conditions, its quality decreases. Coffees, stored for a long period, generate "off-notes", and are also characterized by a definite "flattening" of the cup quality. While the causes of the "off-notes" apparently derive from changes in the lipid fraction of the coffee, the origin and the involved chemical processes of the "flattening" are largely unknown. The sparse hints of physiological changes in coffee seeds are related to soluble carbohydrates, e.g. an increase of glucose concentration, and a simultaneous decrease of the sucrose content. These changes are correlated with the decreasing cup quality of the stored coffee. In this context, it has been totally neglected so far that fresh coffee seeds are living organisms which gradually lose their viability during a prolonged storage period. While a curbed, but controlled metabolism takes place in viable seeds, only uncontrolled reactions (enzymatic or non-enzymatic) occur in the dead and de-compartmented seeds.

We assume that the observed changes in the glucose, and sucrose concentration, respectively, are due to suchlike changes in the physiological status. Those coherences are in principle also valid for other compounds, present in coffee seeds. Due to its metabolic relevance (maintenance of primary maintenance), the carbohydrate metabolism seems to be an ideal tool to detect and evaluate the changes of physiological state of coffee seeds - exemplary also for other metabolic processes. Furthermore, soluble carbohydrates represent important precursors for the various characteristics of coffee (odour, taste, and colour).

In a recent research project, which was focussed on different processing methods of coffee beans, we were able to demonstrate that the causal for the different cup quality of wet and dry

processed coffee is evidently due to a different extent of the induction of germination. These physiological differences are likely to influence also the processes running in green coffee beans during storage.

Outcomes

The spectra of soluble carbohydrates were analyzed in samples differing in the mode of processing and the length of storage. Based on these data, for the first time, putative changes of soluble carbohydrates could be monitored. The combination with sensorial assessments of cup qualities allowed solid deductions for the relevance of physiological and *post mortem* processes in the seeds for the coffee quality.

The German coffee market is characterised by particularly high quality demands. Considering the special coffee products, on which especially smaller roasters have put an emphasis on, as well as the well-known trade-marks on the other hand, the strongest efforts are directed to provide constant quality. In this research project two essential results could be obtained, which in the future could support this efforts.

a) Influence of processing

The results elaborated in this project confirm and complement the findings of our other AIF-project (12181N). We clearly could disprove the doctrine that the quality differences of wet and dry process coffees exclusively is due to differences in the quality of the coffee cherries used and differential diligence given to the specific post harvest treatments. Now, there can be no doubt that the quality of green coffee also is determined by the processing itself and that quality can be modulated by deliberate changes of the processing conditions. It must be assumed that this is due to biochemical processes which are running in the coffee seeds in the course of processing. This knowledge allows specific modulations of the processing in order to influence coffee quality. A corresponding depiction was presented as lecture at the ASIC conference this year. In this context it is very important that all participants – from coffee producers to advisory scientists – realize that coffee beans do not correspond to a dead trading good but represent living organisms which show typical and predictable reactions which can be used for deliberately modifying the properties of green coffees.

b) Influence of storage

Storing green coffee beans inside the parchment layer (as “pergamino”) could reduce the risk of quality losses originating from prolonged storage periods. This is apparently due to an extension of the viability of the beans. Whereas hulled coffee beans lose their viability already within a few months of storage, those beans stored as “pergaminos” in the majority of cases preserve their viability for more than a year. From the relation between the loss of viability and the flattening of the roast aroma two essential applications may be deduced: First, high quality coffees should be purchased and offered as high quality speciality coffees as soon as possible after harvest. Second, the importers of green coffee may push for storage of washed coffees as “pergaminos”, if an immediate transport and further processing should not be possible. While also a transport of the green beans as “pergaminos” may be preferable from the quality view, the elevated costs would probably disapprove such a procedure. However, it may be considered if such a procedure could lead to a high grade product that could be offered as a speciality coffee.

Lectures

Selmar D; Bytof G; Knopp S-E; Bradbury A; Wilkens J; Becker R (2004)

“Biochemical insights into coffee processing” ASIC, Bangalore

Selmar D (2004) “New insights in coffee processing: Quality and nature of green coffees are interconnected with an active seed metabolism” *Botanikertagung*, Braunschweig

Poster

Knopp S-E, Bytof G, Selmar D (2004) “Changes of low molecular carbohydrates during the storage of coffee beans (*Coffea arabica* L.)”. Botanikertagung, Braunschweig

Selmar D; Hunecke D; Junghärtchen I; Breitenstein B; Bytof G, Knopp S-E (2004) “Feasible markers for the estimation of germination processes in differently processed green coffees” ASIC, Bangalore

Publikations

Selmar D; Bytof G; Knopp S-E; Bradbury A; Wilkens J; Becker R (2004)

“Biochemical insights into coffee processing”. 20^{ème} *Colloque Scientifique International sur le Café*. ASIC

Selmar D; Hunecke D; Junghärtchen I; Breitenstein B; Bytof G, Knopp S-E (2004)

“Feasible markers for the estimation of germination processes in differently processed green coffees” 20^{ème} *Colloque Scientifique International sur le Café*. ASIC