

FRUIT JUICE STABILISATION WITHOUT GELATINE

Dr R. Koenitz

Since the authorization of vegetal proteins for the stabilisation of fruit juice, the industry now has an alternative and a vegan solution for the replacement of gelatine.

The advantages of the pea protein and the main application differences compared to gelatine are introduced in this leaflet by Dr. Robert Koenitz and his team from the department non-alcoholic beverages & spirits of Erbslöh Geisenheim AG.

The beverage industry must respond to the steadily growing global requirements and topics like allergenicity and vegan diet are taking more and more importance. Additionally the increasing economic significance of new growing markets with particular religious dietary concerns like kosher and halal nutrition demand new processes for the beverage industry.

A very promising approach is the replacement of gelatine by a purely vegetal raw material. By the admission of vegetal proteins from pea, potato and wheat as approved technical additives listed by the EU regulation 112/2001/EC, new opportunities are available starting from October and their usage in fruit juice is possible.

ADVANTAGES OF CLASSICAL FINING

The visible turbidity in fruit juice consists, besides cell wall components and remaining pectin mostly of vegetal proteins and polyphenols which are often called tannins. In the light acidic fruit medium, these two last groups have an opposite electrical charge. A long storage induces the formation of protein-tannin complexes which tend to precipitate when they reach a specific size. Further components will also be captured in this movement and these aggregates form a sediment depot. The use of classical fining agents accelerates this process, by adding active partners for the precipitation reaction to the fruit juice. The dosage can be adjusted optimally to individual requirements. Until now, animal gelatine was the product of choice for the precipitation of polyphenols. The application is carried out in combination with highly pure bentonite for beverage and colloidal silica to react with proteins and

to remove potential excess of the fining agent gelatine.

The effectivity is thereby acting on two levels. First there is the clarification effect. In the modern apple juice production, this effect is readily obtained by a pure physical separation process like for example the cross-flow filtration. However, in opposition to a pure physical separation process, classical fining agents provide also a stabilising effect. Fruit juice which would for example undergo a physical clarification procedure and where only a fraction of the natural polyphenols would be removed, could encounter a subsequent reaction resulting in precipitation. Depending on the storage conditions, most of the physically stabilised fruit juice develops an increasing brownish colour.

In comparison to different ways fruit juice is clarified and stabilised, the classical fining demonstrates a far better relation for the stability and the sensory qualities (colour and taste).

WHY PEA PROTEIN?

Besides its very good clarification and stabilisation effects, the pea as a raw material source has demonstrated further positive factors compared to all tested plant-based proteins. Depending on the quality requirement, the pea protein is readily available from varieties which have not been genetically modified and which require no labelling concerning allergens. As a natural product pea is not equally pea, which means that not all available isolated proteins produced worldwide fulfill the essential requirements of purity, smelling and tasting neutrality as well as respecting the maximum content in metals, for

<p>ADVANTAGES OF FLORACLAIR®:</p> <ul style="list-style-type: none"> • Clarification and stabilisation effects • Sensory neutral • Kosher and halal certifiable • Allergen free • Genetic modification free



Fig. 1: Comparison of the preparation of gelatine (left) compared to FloraClair® without mixing (middle) and after gentle mixing (right) just before use. © all photos Erbslöh

example iron and zinc. The reference values of the OIV for the wine sector, which are also relevant for the European legislation, recommend max. 300 mg/kg iron and 150 mg/kg zinc are thus relevant for the application in the fruit juice sector, too.

BEVERAGE CLARIFICATION AND STABILISATION WITH THE PURE PLANT-BASED SPECIAL PRODUCT FLORACLAIR®

FloraClair® is a purified plant-based protein from the pea. It is guaranteed free of animal ingredients and thus adapted to the production of vegan, halal and kosher certified food products. Despite similar properties, FloraClair® is not a "plant-based gelatine" but a selected protein isolate especially developed for beverage fining.



Gelatine + Kieselsohl FloraClair® + Tannin Galleol FloraClair® + Kieselsohl

Fig. 2: Comparison of the flocculation between gelatine and pea protein with different precipitation partners.

PREPARATION OF THE FINING AGENT SUSPENSION

The preparation of FloraClair® for beverage treatment proceeds similarly as for the common usage of gelatine, except that the watery solution is more diluted (appr. 5% suspension). In contrast to the clarifying gelatine ErbiGel®, FloraClair® has a very limited solubility at weak acidic pH values. As an extensive sedimentation occurs, the 5% suspension must be carefully mixed, particularly shortly before the withdrawal of a volume for fining. The preparation should also not be excessively mixed as it tends to foam. In practical, transferring with a centrifugal pump has been proven to be a good option.

The efficiency of FloraClair® is clearly increased if the suspension is pre-swollen for 24 h. Thereby it can be emphasized that the watery solution of FloraClair® shows an improved microbiological stability compared to gelatine. The diluted solution can be stored and used during 3 days without any problem.

APPLICATION OF THE FINING AGENT

FloraClair® can replace without problem the clarification process performed more commonly with gelatine. Moreover as observed with gelatine, the use of FloraClair® in combination with colloidal silica and bentonite has been shown to be very efficient for most cases. Longer reaction times are required with pea protein. It is thus recommended to begin the clarification with the pea protein and to mix thoroughly before the addition of bentonite and colloidal silica as it allows a more intensive contact and improves considerably the process. In many assays performed, the protocol was modified as the clarification was sometimes not equivalent to the one obtained with gelatine. This has been an advantageous approach and a sufficient stabilisation was always reached.

While a compact floc is formed with gelatine which tends to settle after a while, the floc obtained with pea protein is more diffused and might stay in suspense. However, it is efficiently and easily filtered using the common filter aids (fig. 2). Acidic or basic colloidal silica are both equally appropriate in combination with FloraClair®. As a complete plant-based concept, the use of tannin is an optimal flocculation partner (fig. 2). Besides the considerably smaller and compact sediment volume due to a lesser extent of sedimentation (only about 2 – 3 % compared to colloidal silica), the clarification result and particularly the time needed for sedimentation are optimised with the special and pure clarification tannin Galleol. This is especially meaningful by coloured fruit juices (strawberry, red currant) because the efficiency of the filtration and the storage stability are directly depending on the quality of the fining procedure.

FIG. 3: NATURALLY CLOUDY APPLE JUICE AFTER FINING WITH FLORACLAIR® (+ BENTONITE & COLLOIDAL SILICA)

	NTU from filter (mix sample)	NTU after forcing test
Sheet filtration	1.14	1.24
Microfiltration	0.6	0.74
Ultrafiltration	0.48	0.54

Fig. 3: Comparison of the stability after different filtration processes (Source: Ludwig, M. Geisenheim University – ATUF 2013)

The recommended concentration ratio is about 8:1 for FloraClair® to tannin Galleol respectively.

Besides the clarification effect sought by the usage of classical fining agents, the stabilisation effect is very meaningful, for example if the clarified suspension is further applied on a cross-flow filtration system. The assays conducted at the Geisenheim University and the results obtained on naturally cloudy apple juice confirm the positive experiences with FloraClair® (fig. 3).

REDUCED RISK OF OVERFINING

FloraClair® has been applied on apple juice in a series of tests and 100% of them were successfully stabilised. Even when very high (after-) dosage were applied to force overfining, the fining protein could be settled easily with some bentonite and colloidal silica (confirmation with heat-test). According to the experiences accumulated so far, the risk of an overfining is thus very small compared to gelatine and it might be explained by the low solubility of the pea protein (fig. 1).

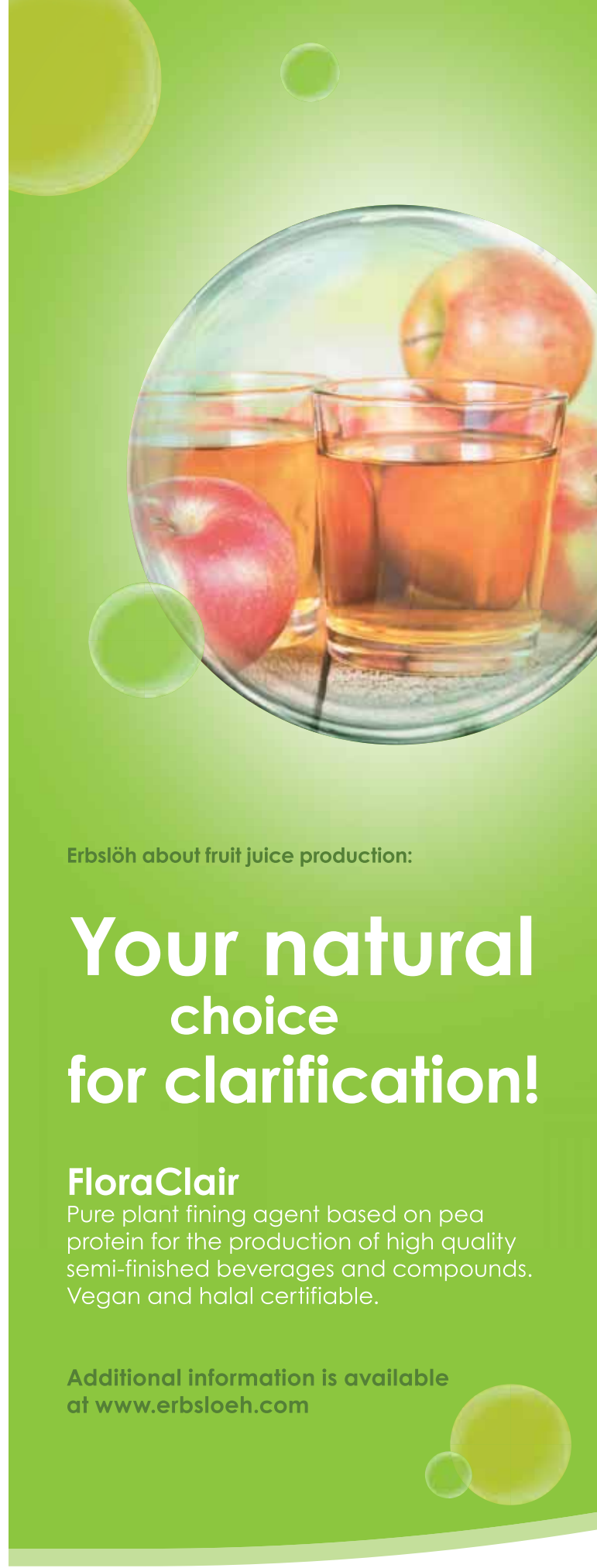
EXPERIENCES COLLECTED SO FAR WITH FLORACLAIR®

In the last 12 months, numerous large-scale technical applications with different beverage raw materials have been tested successfully with FloraClair® in collaboration with industrial partners and research institutions. Among these wine, fruit wine (colourful fruit, cider, etc.), fruit vinegar, tea-based beverages and of course different raw juices and cloudy concentrated fruit juices from different types and origins were tested.



AUTHOR

Dr Robert Koenitz
 Erbslöh Geisenheim AG
 65366 Geisenheim / Germany
www.erbsloeh.com



Erbslöh about fruit juice production:

Your natural choice for clarification!

FloraClair

Pure plant fining agent based on pea protein for the production of high quality semi-finished beverages and compounds. Vegan and halal certifiable.

Additional information is available at www.erbsloeh.com