



Getreidezüchtung Peter Kunz Association for Crop Development Biodynamic Plant Breeding



Adaptation to climate change and organic cultivation

Peter Kunz

In Switzerland, climate change is much more noticeable than in the rest of the world. Since 1850, temperature has risen by 1.8° C, while globally 0.9° C on average. In order to limit the damage, urgent action is required. This is the conclusion of the ProClimForum with 70 Swiss climate researchers.

In order to limit the damage, urgent action is required. This is the conclusion of the ProClimForum with 70 Swiss climate researchers. Agriculture is particularly affected by this. The wheat harvest is 10 days earlier than 50 years ago and extremes occurred more often, as the last few years have shown. The year 2015 was extremely hot and dry, while 2016 was extremely wet and cool. Such scenarios are more and more likely to occur. What does this mean for organic breeding? In general, organic cultivation needs suitably adapted varieties. But are the current efforts enough or are additional tools needed to meet this challenge?

High expectations of the varieties

Everyone - farmers, processors and consumers expect the crop plants to be as stable regarding production and quality as possible. In cultivating the seed for sowing, however, even the best practitioner does not know whether his plants will suffer in the coming year from heat and drought, or from cold and wet circumstances; possibly one shortly followed by another; leading from one extreme to other. This is what crops, and especially organic cultivated varieties, must endure! Is this feasible?

Organic cultivation also requires an adaptation to regional as well as specific, local and vegetation conditions. This requirement is expressed in the term "farmer variety". But is this the way to go? Without any doubt, we need plants that can adapt to organic or biodynamic farming systems. These are varieties which are better able to deal with the limited resources available than conventionally cultivated varieties that are grown and nurtured in a conventional way using all kinds of fertilizers and nutrients.

In the plant organism, which forms the basis of organic cultivation, the crop varieties form along with local conditions of location and agronomic measures (crop rotation, fertilization and cultivation measures) a finely tuned unity from which they grow and thrive and produce their fruits. This unit is at the same time the starting point and the goal of the biodynamic breeding.

Events Calendar

Wednesday, February 8, 2017

Kultur im Labor, Feldbach

Wednesday, March 8, 2017

Kultur im Labor, Feldbach

Saturday, July 1, 2017

Breeding garden open day, GZPK, Feldbach

Thursday, June 8, 2017

Organic farming day, Cournillens FR

Details at www.gzpk.ch

Stability and ability to adjust

Primarily, the adaptation performance of crops is based on their ability to handle environmental conditions during the vegetative growth phase. This is particularly important for yield performance. In the subsequent fructification and maturation phase, which is mainly associated with quality, the plants are only slightly influenced by the environmental conditions. For stable varieties, the adaptation from one to the next generation will not change; the WIWA variety still provides the same stability as it did in 2001, 15 years after its official application. An adaptation of varieties to climatic changes and weather extremes is therefore only required to better ensure yield and quality. In many properties of varieties, such as in case of protein strength, sugar content, or oil content of fruits, an adjustment is fundamentally undesirable. In many cases, the breeding progress is precisely to render the crops relatively independent of adverse weather conditions. Depending on the characteristic, adaptation means something different. One single approach does not cut it. The contribution of each individual characteristic for ensuring yield and quality, must be examined separately.

Natural Selection and Adaptation

Natural selection is often an important contribution to the improvement of varieties; nature "will take care of it". However, natural selection often entails survival of the fittest; the varieties with the largest number of offspring are the strongest. Natural selection always encourages the most reproductive, however, always at the expense of the fruit and often at the expense of quality. This applies to line varieties as well as to multi-line varieties, to heterogeneous populations and to hybrid varieties. The breeders therefore always have to opt to some extent against reproduction; the fewer, the better for developing fruits or seeds. The best quality comes from a balance of reproduction and fructification. A good variety is reliable, since it is able to keep this balance stable. When this is the case, it will bring satisfactory results to growers, processors and consumers over many years.

Breeding for adaptability

How can targeted breeding in the GZPK enable high adaptability? It is important that future varieties are cultivated and tested under very different, even contradictory growth conditions. Since the adaptation performance is mainly carried out during the vegetative growth period, the test sites must differ in the vegetative phase. A fodder site with a consistent good water supply promotes vegetative growth; a lot of straw and a relatively low grain yield are the results. On the other hand, the generative phase and the grain formation are predominantly promoted in a dry-warm location with sandy soil; the straw yield is lower, so the grains are well formed, providing that lack of water is not too severe. Such extreme locations are represented in the GZPK by Feldbach and Rheinau. In Rheinau, it is often necessary to irrigate as early as May, so that the crops do not collapse completely and wither. In Feldbach, the plants grow strongly even in the driest summer. Therefore, the GZPK variety candidates must deal with extreme weather conditions even in normal years. The site becomes effective as a unity and the ability of the variety to deal with it is included in the review. Each year, only those who are strong and show good grain cultivation are passed on. This is the only way to ensure that they will continue to be stable in the future under extreme conditions and will be able to handle the limited resources available in organic farming efficiently.

This strict approach - as the results of the last two years have clearly demonstrated, - is highly successful. But it has to be further developed and refined in the coming years!

When during breeding not only the mass yield, but also the stable quality performance has the highest priority, it is always possible to achieve new breeding advancements and thus also adapt the plants to climate change. Plant growth entails an infinite variety of ways to achieve this goal. The big challenge for breeders is to see this diversity in the breeding ground, to recognize the effective adaptation and to make the right selection decisions.

Let us now return to the questions raised at the outset. „Adaptation“ is a delicate network of interactions in the environment in which the plants live, which can influence the growth and the development of the plants. Improving the adaptation enables the plants to be better able to deal with restricting and promoting influences.

Fonds für Kulturpflanzenentwicklung

Current Projects

The fund participated in the Gasswies Farm in Klettgau in 2016. In several strategy workshops, the further development of the farm was handled.

Spring 2017, the project „Seed and Non-Profit“ with the collaboration of Peter Kunz and Ueli Hurter will be published. The fund will also participate in the founding of an Italian foundation for biodynamic plant breeding in 2017.

Donations and Bequests

The foundation is recognized as a non-profit organization, which means that donations are tax-deductible. With a bequest, you can help to secure and improve the development conditions of biodynamic breeding in the long term. Questions regarding bequests and testaments are often complex. If you want, can bring you in contact with an independent and competent expert.

More information at:

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Catherine Cuendet is leading our spelt breeding program in Germany and participating in European research projects.

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An institute for breeding in Italy

The biodynamic durum wheat cultivation in Italy needs a long-term perspective, since this cultivated plant is far too important and cannot be cultivated as a sideline or remotely. That is the reason why a charitable foundation for biodynamic breeding will be founded in Italy in early 2017. Bio-breeding and the use of bio-cultivated varieties has hardly been addressed in the whole Mediterranean. For the development of sustainable agriculture for this cultivation, suitable varieties are of central importance. We want to use our expertise which we have built over many years there. In recent years, Italian farmers had very good experiences with the GZPK-wheat varieties. That is why we can count on the support of many partners.

For the founding of the institute in Italy and for start capital, we are also looking for other patrons who want to support this initiative.

Durum Wheat

Peter Kunz, Salvatore Iapichella

The three-year test of 55 variety candidates in the four regions of Marche, Molise, Apulia and Sicily showed very nice results despite difficult weather conditions and the partners (EcorNaturasi, Girolomoni, Fattoria di Vaira, University of Palermo and CRA Foggia) were interested and participating farmers also reacted kindly.

Based on the visual assessment of the plants and the quality of the harvested grains, eleven favorites were selected in a first selection stage. These favorites performed above average and they will be planted now together with four standards and 15 new durum wheat of the University of Palermo by CREA Foggia for the second year of testing. At the same time, emmer, common wheat, triticale and spelt from the ongoing GZPK-projects, which may be suitable for cultivation in Italy, are also being tested. If all goes well, we will be able to report on varietal candidates within one year. In the winter, further quality tests are conducted for the production of pasta and pastry, since in the south durum wheat is often also consumed as bread.



Spelt

Catherine Cuendet, Franca dell'Avo

Courage for diversity

There is change in the spelt market. Every year, new varieties are admitted, as many as never before in the spelt breeding history. Why? The spelt market is experiencing a new upswing again. Demand and prices are rising, and with the short straws from the conventional breeding, optimal yields can be achieved. This also attracts other seed companies to buy lines at the State Seed Breeding Institute Hohenheim and submit for official examination with comparatively little effort. The demands on the varieties, with climatic conditions, prematureness, winter resistance and plant health are becoming more and more diverse, since spelt is also grown in countries without a spelt tradition and must also prove themselves there.

At the same time, there is a gap - at one side the demand for intensive sorts, and on the other side extensive varieties in the style of old country varieties with low stability. The first group of varieties is requested by farmers who are more focused on yield performance, the second by tradition-oriented farmers and processors. Both options tend to see spelt in a way that leaves little room for maneuver. The gap also exists regarding quality. The needs of the processors range from spelt-typical soft doughs to those with qualities similar to wheat. The crop spelt is pulled to all sides. At the same time, climatic changes are taking place and new breeding techniques are available which degrade the plants into a modular system and, ultimately, the grain as such is discredited by increasing incompatibilities. We see the movements in the spelt market as an opportunity for the crop. There must be more diversity in the fields. A wide diversity is also possible with spelt. But the crop does not show this, since a very large part was lost in the past century when spelt almost completely disappeared from the cultivation. Diversity must be enabled again by breeding. But we should not limit it to fixed notions of what and how spelt should be. Otherwise we end up the same way as a few years ago with bananas!

Eight GZPK variety candidates have passed through the first official inspection year. The intermediate results are almost all positive. For example, ZAL.12 reached the highest score of the 16 newly tested candidates and MULELL.1 the second highest. However, in case of the latter, the leaf-spot susceptibility was classified as critical. Nevertheless, we have admitted MULELL.1 to the 2nd year of testing, since it is convincing in the total of characteristics and it is also a very early variety.

Also in the German variety test in Crailsheim-Beuerlbach, ZAL.12 and PSZS.12 achieved the best yields of all tested varieties even though our primary breeds did not have optimal yields. We withdrew two candidates for lack of performance. SK-SAML.11 proceeds as a replacement into the 2nd year of testing; it enticed all visitors with its beautiful, bright ripening color.

With these and future variety candidates, we want to find a balance between the country cultivars and short intensive varieties. We want to create room for diversity in order to meet the various demands in the European countries.

Wheat

Michael Locher, Nicole Bischofberger

Yield and quality stability in difficult years thanks to strict grain selection

The cereal year was characterized by a mild winter, a wet May/June and a hot and dry July. The extremely cool early summer with the resulting diminished spikelet and grain forming, resulted in small, often unsightly grains, weak yields, extremely low hectoliter weights, as well as high protein and cellulosic values. In many cases, farmers had to deal with reductions. Also mills and bakeries were facing major challenges in processing the harvest.

In this extreme year, the GZPK varieties and candidates showed the advantage of their robustness - at the grain harvesting stations, in the seed propagation as well as in the official variety testing in Switzerland, Germany and France. Compared to the conventionally cultured ones, the losses in yield and especially in hectoliter weights, were significantly lower. The GZPK varieties also performed well regarding infestation of Fusarium. The content of highly toxic mycotoxins (Deoxynivalenol or DON) was far below the average (see image).

DON content in relation to the hectoliter weight of GZPK varieties

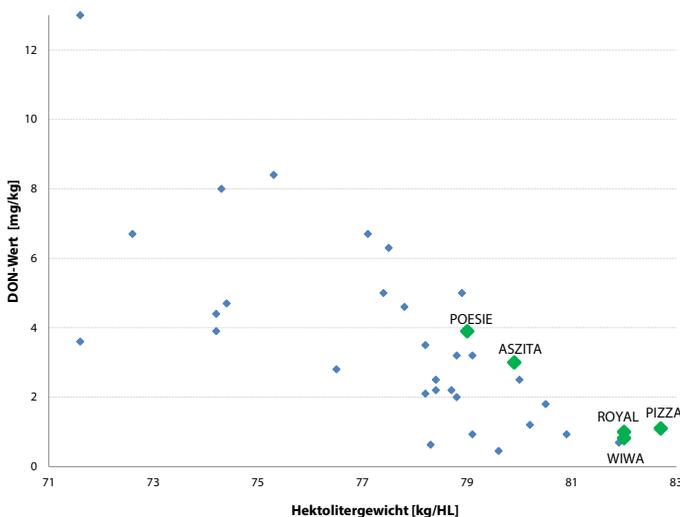


Image: DON content (Deoxynivalenol) in relation to the hectoliter weight. Evaluation 2016 of the official eco-varietal test Crailsheim-Beuerbach, Germany. GZPK varieties are marked in green.

Where does this striking difference come from? In addition to leaf and spike health, yield and quality, additional properties are decisive in organic plant breeding. For example, plants with too short stalks seldom show the wanted natural slow and intensive maturation, which is a prerequisite for healthy and full grains. It must therefore be selected accordingly very strictly in the field. In this climate-wise extreme year, it was demonstrated again how worthwhile grain selection is. The results in 2016 can be seen as an indication that in difficult environmental conditions, the organic cultivated varieties are actually more adaptable than conventional ones.

Baking quality determination at smallest sample sizes

The processors have very high demands regarding organic wheat varieties. Consistent high quality over several harvesting periods is required. 70% of the domestic organic sugar is processed in Coop and Migros bakery factories and smaller bakers have the same demands in most cases. Both in Switzerland and abroad, the outstanding processing properties of the GZPK varieties are increasingly becoming a hallmark.

In order to determine these properties as early as possible in the breeding cycle, analytical methods with the smallest test quantities are required. But all the fast methods used up till now are only rough and uncertain approaches. They can only be reliable using a baking test, since the processing quality is a highly complex characteristic. In the summer of 2015, a mini baking-test was developed and evaluated in winter 2015/16 with a set of 33 varieties. From 100g of flour 2 x 3 rolls of 25 grams with fermentation of 30, 45 and 60 minutes were baked and evaluated regarding bread volume, porosity, crumbs, crust as well as shape and level. The evaluation showed a reliable reproducibility. At the same time, an optimization potential was shown independent of the raw protein content; the expected improvement in N-efficiency in processing.

An exact prediction of the baking quality is also based on the extensogram. However, 300g of flour and three hours of analysis time per sample were required, which is too much. With the newly acquired micro-extensograph in the GZPK, the same examination can be carried out with only 4 g of flour in 20 minutes. This will allow us to determine the baking quality very precisely even in early breeding strains. This allows for stricter selection. The breeding process is thus more streamlined and cultivation lines can be identified which, despite their low protein content, have the necessary baking properties.

In the long term, specific product developments for such nitrogen-efficient wheat varieties can also be carried out with the aid of a micro-baking experiment and micro-extensogram. This makes a more economical use of the nitrogen resource possible not only in the cultivation but also in the subsequent stages of the value chain. Nitrogen as an essential element for plant growth has always been deficient in organic farming. For conventional agriculture, it is produced industrially as a mineral fertilizer and leads to immense environmental and drinking water pollution, in addition to high energy consumption.



Image: Grain formation 2016; GZPK variety ROYAL left, conventional variety on the right side. Differences in grain filling, color, texture

Wheat: Results of Varieties and Prospects

- In the first year of the Agroscope main as well as organic trials, both GZPK candidates completed with high results, with quality ranging from average (ZISCA.5) to very good (TASCA.5)
- Two new candidates were registered again: PESI.3011 is a N-efficient type, and ASSC.3685 is a top variety candidate.
- Due to the increasing demand of low input conventional farmers for our varieties, ROYAL is registered for the Swiss Granum examination and WIWA. After not being considered in 2014, it is once again recommended for the Extenso varieties list.
- PIZZA is going to be propagated on a large scale after two very good years in FiBL variety testing and will offer the farmers and processors a reliable alternative for WIWA.
- The new N-efficient ROYAL variety is in high demand in Germany and France and is being propagated there. Seeds will be available next autumn.



Emmer

Franca dell'Avo

The great interest of farmers in new, healthy emmer varieties shows the necessity of the NAP-PGREL emmer project, which has been supported by the Federation since 2016.

First, crossings were used as the basis for further breeding. In addition, a yellow rust-resistant winter emmer line could be registered under the name SEPHORA. This concerns a variety from a bulk of different Emmer strains, selected in the last years by Catherine Cuendet in Darmstadt. SEPHORA is very healthy both regarding leaves and spikes. It has rather long, flexible stems. It has an intense green hue during vegetation and which later turns brown. The yields are good and so are the stability and health.



Breeding work with durum wheat, Feldbach

Triticale

Cora Schibli, Benedikt Haug

Setting the course for double use

The strict selection of recent years on yellow rust resistance and good organic suitability is noticeable. The later breeding stages have meanwhile reduced by approximately 30-40%; the triticale breeding has gained in efficiency. Registered in the varieties catalogue are two medium-long varieties with high yield potential, which came from Agroscope's breeding materials, which we took over five years ago.

The breeding line MPP.12, which is designed for double use (animal feed and baking cereals), has received variety protection. The approval of the variety is still pending. In order to gain a better understanding of the baking properties of triticale, a method of baking was carried out with the Institute for Grain Processing (IGV) in Potsdam. For the experiments, the GZPK strain MPP.12 was used. For comparison, the following factors were investigated: degree of grinding, flour mixture, fermentation, acidification, percentage of yeast, and bread shape. It has been found that bread in a bread bin with normal fermentation, regardless of the whole grain flour percentage, achieves the best baking qualities. The flavoring and valuable ingredients of the husk, which are lost in a typical flour type, can have a positive effect in whole grain bread.

Pioneering in viscosity research

In addition to the development of bakery varieties, GZPK also conducts pioneering work in feed triticale. In conventional feed crop breeding, the viscosity is not important because it is controlled in the feed mixture with the addition of synthetic enzymes. For this reason, many varieties are completely unsuitable for organic poultry feeds. The viscosity should be reduced, inter alia, for reasons of barn sanitation. The multi-year analyzes in collaboration with Agroscope Changins showed that the viscosity is inherent environmentally stable. What was missing up till now was a simple and cost-effective quick test. During a creative night session, the quick test idea was tested and realized. A moist ball of whole grain flour was rolled between the fingers. The stickier the fingers, the higher the viscosity score. Taking into account the protein content of the sample, a useful correlation between the „sensed“ and the measured laboratory data was obtained. This method allows for a negative selection in early breeding stages - exactly what we urgently need! The test was used for selection for the first time this year and can be replicated independently.

However, the reduction of the viscosity should be done carefully, since these soluble fibers, the pentosans, can also be in demand. A deepened understanding of their functions in the growth and maturation of the grain with regard to a positive health value is needed.

Pentosans also have an influence on the baking process. Therefore, the cooperation with the IGV in Potsdam is continued. Since other types of cereals also have large variances in viscosity, the wheat and spelt projects could also benefit from this research.

Maize

Stefanie Rost, Peter Kunz

The heavy rainfall in the spring caused a delay in maize. Later on, the possibility for weed control was severely limited. This resulted in the fact that maize had to compete with fast growing weeds during its early growth. This allows a variety to be competitive, but leads to irregular stocks. During the flowering season in July, there was repeatedly heavy precipitation, which made hand pollination more difficult; during rain, pollen becomes lumpy and sticks to the tassels. The separately conducted resistance test had to be abandoned because the maize plants were too slow in their development and the trials did not promise any success.

Population Varieties

Except in developing countries, today's maize varieties are almost exclusively hybrids. It is heavily discussed in organic farming that farmers need to buy new seeds every year. Therefore it is very urgent to develop reproducible varieties. This will allow access to high-quality genetically modified breeding material for the future. At the same time, the dependency on the large seed companies can be reduced.

The focus is on the development and maintenance of a Central European base population for silage and grain maize and the development of cultivable populations. For this purpose, the Feldbacher OPM.12 is selected annually and continued. The previous maize varieties recommendation for organic farming from the FiBL is based on the conventional varieties evaluation (Swiss Granum) or directly from the breeders. This is going to change. In 2017, a performance test under organic circumstances will be conducted for the first time. The results are then going to be summarized by the FiBL in a recommendation for varieties. The GZPK is one of the test sites and will test the OPM.12 under these conditions. Positive results also came from France. The OPM.12 was repeatedly part of the AgroBio Perigord trials and was by far the most powerful and healthy population compared to the regional populations.

Protein Maize

Colleagues from the USA have shown that with HQ maize you can do without soy protein and without the addition of synthetic amino acids. Certain amino acids are essential for all monogastrics. In case of deficit, cannibalism takes place (feather pecking among chickens or tail biting among pigs). The goal of the High Quality (HQ) maize project is therefore creating varieties with a high total protein and methionine content for human nutrition and poultry feeding. This is intended to improve the internal, domestic and/or European protein supply. In order to be able to cultivate stable varieties, the characteristics resulting from exotic lines have to be stabilized plants adapted to the local climate. This can only be done by means of a crossing and subsequent selfing, since these special properties in a variety would be lost too quickly. These inbred lines can be selected for strictly their agronomic suitability (stability, health of leaves, stalks and cobs, vigor and early maturity) and simultaneously with the light-table method combined with NIRS for the desired quality.

The 200 best inbred line selfing cobs from 2015 were cultivated for a further selfing. Once again, the first test crossings were carried out with the best lines. The first two HQ

test populations - from the crossings in 2015 - also grew in Feldbach. After rigorous selection in the field and in the laboratory, a few grains from each selected cob was sent to Sicily for propagation in the winter breeding garden. The cobs harvested in Sicily will return to us next spring. They will be harvested, analyzed and selected. The remaining elite kernels will then in 2017 be cultivated in an insulated plot in Feldbach and will be selected based on good agronomic properties in the field. The goal is to have enough harvested material for a first poultry feeding trial after a further propagation cycle in the winter breeding garden 2018 in order to

Grain Legumes

Agata Leska, Simon Dörr

With high precipitation, 2016 was not a good summer for peas. This year's yields (25 - 40 dt/ha) are clearly below the perennial average of 50 - 65 dt/ha, since many varieties went into storage and had hulls that were too small. The protein content also was very low. In addition, all four sites suffered a very strong outburst of the ascochyta. As in previous years, the infestation of pea leaf weevils and seed beetles increased again. Fortunately, certain lines showed a strong resistance. We assume that the degree of infestation has to do with the color of the peas. In order to check this hypothesis, trials with selected lines will be conducted next year.

Starting 2017, a project for the cultivation of white lupines will be initiated together with FiBL Switzerland.

GZPK Grain Legumes Day

During this year's Grain Legumes Day that started on June 2 in the Strickhof in Lindau, the mixed cultivation of grain legumes (peas, lupines and lentils) with cereals took center stage. The 20 varieties from Poland, Czech Republic, Germany and Switzerland that we presented, attracted a lot of interest from the around 60 participants. Cereals as a mixing partner enables suppression of weeds and support the legumes, thus facilitating the harvest.

Winter Peas

The trial of the winter pea breeding lines from Darzau, in mixed culture with triticale, was conducted at two sites with the support of Bio Suisse. The mild winter did not allow to gather any information about the winter hardness and therefore no selection of variety candidates could be made. The humid spring and early summer weather created optimal conditions for Anthracnose, which infected the whole trial, favored by the fact that mixed plants went into storage.

Summer Peas

The entire GZPK breeding program has been expanded with two new sites. At the Lindau ZH site, the 20 most recent European varieties and 4 own candidate varieties were tested. The waterlogging impacted the pea development negatively and a strong *Fusarium* infestation was observed. A harvest of the trial was not possible.

Also at the new Uster site, the peas have suffered from waterlogging, which resulted in oxygen deficiency. This, in turn, prevented the formation of rhizobia and resulting nitrogen fixation. Therefore the summer peas were partly poorly developed. Nevertheless 120 individual plants could be selected. Altogether, 570 individual plants were sown for the purpose of winter propagation in Sicily.

Eternal pea cultivation: resistance to soil exhaustion

The eternal pea cultivation goes into the next phase. In collaboration with FiBL Switzerland, we are testing around 100 lines and varieties for resistance to soil exhaustion. Lines and varieties that pass the greenhouse trial will be planted in the field in 2017. This field will be managed as pea monoculture by GZPK and FiBL during the coming years.

Phytopathology: Smut and Fusarium in focus

Verena Weyermann

In and around our breeding garden, a lot has happened. In a joint team effort, it was successfully sown by hand in autumn 2015. By sowing manually, we prevented the contamination of the seed drill with smut (*Tilletia caries*) and the risk of spreading the disease to the other breeding gardens. After the wheat blossom, our new tunnel frames were used for anti-bird netting. The anti-bird nets have never been set up so quickly and easily. They are also robust and resistant to wind and weather.

The integration of the smut-resistant wheat lines from the remote breeding yard into the conventional breeding process is on the right track and is constantly being optimized. The very promising lines have already been crossed again. Recently, smut-resistant spelt lines were also selected from the breeding garden for further breeding work at Catherine Cuendet in Darmstadt.

Fusarium

The wet weather this spring and summer favored the growth of fungi. Conditions for the different kinds of *Fusarium* were perfect. *Fusarium* fungi occur naturally in the soil and are important for the degradation processes of plant material. Only a few of the *Fusarium* species are harmful fungi, responsible for the total loss of cereals and maize yields. The mycotoxins formed by the fungi are their natural metabolic products and can lead to considerable loss of quality. They are harmful for humans and animals. Especially pigs are susceptible to these toxins. *Fusarium* hibernates on corn stumps and cereals remnants and comes in direct contact with the plants in the spring during warm, humid weather with the help of the rain drops

In order to enable *Fusarium* susceptibility as a reliable selection criterion in the maize cultivation program, we have used two methods for artificial *Fusarium* infection of maize cobs this summer. In one method, the fungus was infected as a spore suspension with a syringe via the silk channel into the tassel. In the other method, the tassel was pierced with a toothpick previously treated with spore suspension. Both methods resulted in infection. The infection was stronger with the toothpick-method and was easier to carry out.

Sun Flowers

Herbert Völkle, Charlotte Aichholz

In 2016, both sunflower populations were selected for unbranched plants and only strong growing plants were selected. Until now, the sunflowers were chosen and planted. New was that it could be converted to direct mechanical sowing. The plants were therefore growing under practical conditions and could be selected for health and vigor even at the sapling stage. The selection and the pollination with bumblebee populations takes place in the net tunnels of Sativa Rheinau in order to prevent the pollination of foreign pollen by insects and birds.

New future tasks are the balance between prematurity and yield as well as between sterility and fertility.



Healthy Minor Cereals

Within the framework of the EU project Healthy Minor Cereals (HMC), 80 spelt varieties were artificially inoculated with *Fusarium* and evaluated accordingly. However, the *Fusarium* evaluation in the field did not always correlate with the toxin levels of Deoxynivalenol (DON) measured in the laboratory.

The 80 spelt varieties will be tested this winter for the mycotoxin content by means of ELISA (Enzyme Linked Immunosorbent Assay) at the Crop Research Institute in Prague.

Review and Outlook

In a large part of Europe, we experienced a dramatic cereals year, and therefore an exciting year for breeding. Positive feedback was received from France, Southern Germany, Italy and Switzerland regarding the performance of the GZPK wheat varieties, which were able to develop a beautiful, healthy grain and good baking quality under extremely difficult weather conditions.

This is for us the incentive to focus on all-round healthy plants. With all the detailed knowledge about resistances and plant diseases, we can only imagine the cultivation conditions and requirements for the future. Resiliency and adaptability will certainly gain in importance.

Good news and challenges

In January 2017, a further training week for biodynamic breeders will take place in Feldbach. It is a first module of a comprehensive training that we are organizing in a European context.

GZPK varieties in Europe: In France, our varieties could be placed and multiplied in national and regional organic trials, in particular through the support of our „ambassador“ Philippe Jouanneau. In Lithuania, a field trial with WIWA was carried out across the country. In Italy, the whole range of varieties of wheat was planted on the farms of Ecornaturasi.

As the diversity of varieties increases, which is a positive development, the expenses for obtaining and maintaining basic seeds are also increasing. We are working on a network of propagators to spread the risk over several regions and farms.

Apart from the acquisition of new projects, financing of the GZPK remains a challenge. Virtually all projects require our own share of financing. However, only private donations, seed licenses and some contributions from organizations are our own capital resources.

The partnership with the Coop Fund for Sustainability, which dates from 2003, could be extended for another five years. The Saatgutfonds of the Zukunftsstiftung Landwirtschaft has been existing for more than 20 years, generating more than EUR 1 million annually, also supports the GZPK projects. We also greatly appreciate the faithful support of the project partners from the organic and natural cosmetics sector in the sunflower project. This long-term relationships are particularly valuable to us, as are the many loyal private donations.

New Employee

Also this year, we were able to offer an intern at the end of his internship a one-year contract. Mr. Simon Dörr, M.Sc. Agr. From Saarland will join the GZPK team starting in 2017. His main focus will be on grain legume cultivation. We are happy about him joining us!



“I am happy to have the opportunity to further explore and work in the exciting field of organic plant breeding. I am especially interested in the holistic view of the plants.”

Farm saved seeds, an unsolved problem!

Peter Kunz

While protection of varieties ensures breeders a propagation license for produced seeds, farmers are able to produce replica seed for their own needs with easily reproducible species such as cereals, beans, peas, and lupines. This means that the breeders will miss out on important income for financing their work. This also applies to the biodynamic breeders. In Germany alone, they missed out on an estimated 300,000 euro annually. With this amount, a whole grape harvesting program could be financed. Also for this reason, biodynamic breeders need support from private donors, seed funds and foundations.

When a farmer reproduces a variety because it has proved to meet his or her demands and requirements as well as the quality requirements of his/her customers, it should be self-evident that he or she will pay the breeder for the use of the variety. The division of labor requires in all fairness that a division of revenues takes place. In Germany, this issue is so sensitive that the organic breeders have not allowed the despised Saatgut Treuhand to manage the propagation of their varieties and to collect the fees. However, the request to voluntarily pay in order to support the eco-cultivation have hitherto not been very successful. The large conventional breeders are able to work on hybrid cereals varieties by putting pressure and getting support from the State, which then must be renewed annually in order to secure the financing of the further activities. For organic farmers, however, this means that the support of biologically dynamic breeding is directly beneficial to them!



Getreidezüchtung Peter Kunz Verein für Kulturpflanzenentwicklung

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