

# The new Turnip Yellow Virus (TuYV) generation of Rapool enable flexible Nitrogen fertilization in spring

The new Turnip Yellow Virus (TuYV) generation of Rapool enable flexible Nitrogen fertilization in spring – a sustainable solution for a better cost efficiency in rapeseed?

Winter rapeseed belongs with its high cross margin potential to one of the most attractive crops in the European crop rotation. But the production of rapeseed came under pressure in the last years: political adjustments (ban of Neonic treatments), climate changes (more heat and drought), increase of new pests (aphids) and a volatile market increase the challenges for a successful yield result.

The European rapeseed breeders recognized such problems already a few years ago, adapt their breeding material and offer with the new TuYV generation a powerful tool for the production conditions in 2020. Internal analysis present, that the next generation is establishing more biomass before winter and has a higher flexibility regarding spring fertilization. What does it mean for the rapeseed production in the coming years?

The variety testing is one of the traditional activities for a successful breeder. This approach is also for RAPOOL one of the most important points of the own philosophy. After the positive registration of new candidates, we continue with further internal testing to offer our customers the best hybrids, suitable for their local conditions.

Rapool Polska established for such new candidates a special internal testing network together with the NPZ breeding station in Gola. They test a selected portfolio of new candidates together with main varieties from the Polish rapeseed market. The trial includes a set of 6 varieties, 5 different nitrogen dosages, 2 different sowing dates (normal + late) and everything checked on 3 replications by plot in plot system.

The long-term approach for such trial networks connected with further practical challenges is without any discussion, especially if we check the last years (2018 & 2019). While in 2017 the sowing was influenced by wet conditions as a result of heavy rainfalls, which lead into a vigorous growth, the sowing 2018 was affected by drought, which result into deeper taproots. Additionally, we observed that the late sown block present similar establishment before winter as the normal sown one (14 days earlier).



Next to the general establishment before winter of our selected varieties, we checked also the single plant development with extensive scoring of the dry mass. For this we have taken samples out from the different plots and measured them separately. The graph No.1 below clearly presents clear the advantage of the new TuYV trait for our tested candidates in 2017/2018, which is not only protecting against the new upcoming Virus, rather it also supports the establishment before winter with an additional growth boost.

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But what are the first trends after two years of intensive testing? The new TuYV pipeline of Rapool breeding present:

- Vigorous growth before winter
- Stronger biomass based on bigger single plant dry mass
- Higher uptake of nitrogen before winter

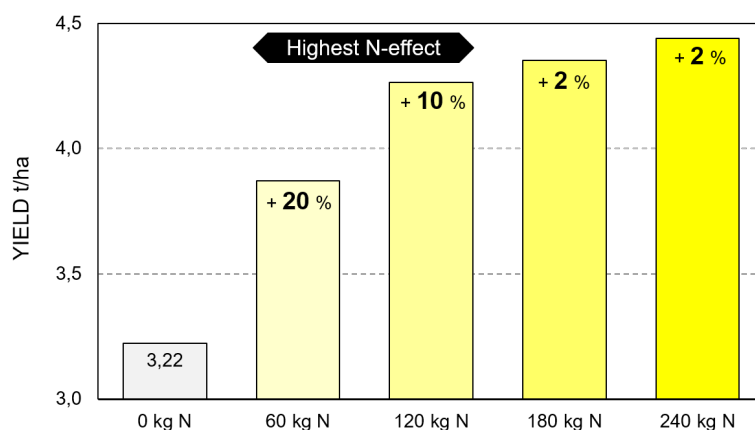
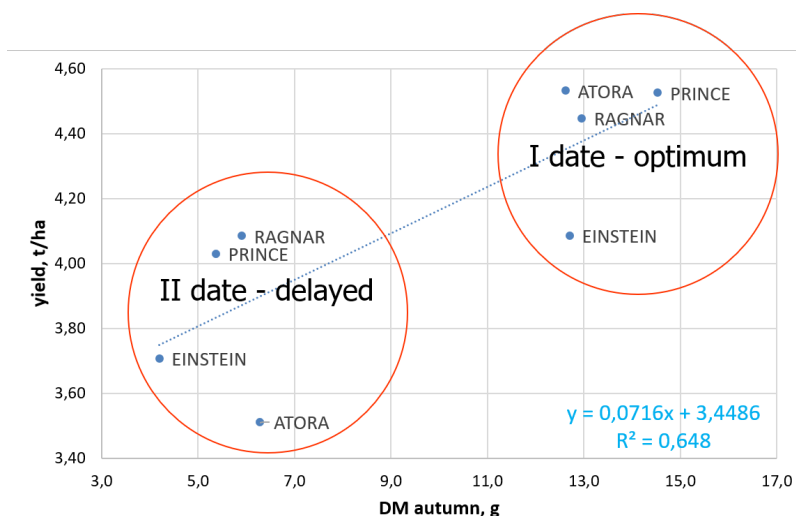
Especially the last point is getting a more and more deep importance, since we see a further political, respectively society change. The trend is clear, the future nitrogen fertilization based on stronger environmental protection developments will be limited in their total amount and distribution. This requires sustainable solutions for our Rapool customers in the different European markets.

Based on the two-year analysis from Rapool Polska we can confirm that our modern hybrids are already adapted on a lower nitrogen usage. While varieties in the 1990 needed more than 6 kg N/100 kg yield[1], today's hybrids require only 4,7 kg N/100 kg[2]. This underlines the breeding progress of modern hybrids regarding an improved nitrogen efficiency and at the same time the role of breeding as a solution for the current challenges in rapeseed production.

The graph No. 2 below is presenting very well the correlation between strongly established plants before winter and the yield potential in the coming harvest. We can observe that our modern hybrids are able to make a satisfying yield also without nitrogen fertilization in spring of more than 3 t/ha, based on vigorous growth in autumn. The next nitrogen dosages (60 kg N/ha and 120 kg N/ha) show clear the highest yield effects with +20 %, respectively +10 % more production. Further increase in the application of nitrogen results only in quite low effects, which are not efficient under the economical point of view. These data confirm very well older data from an extensive investigation of UFOP in Germany (2006 – 2009), where the variety reactions to different nitrogen dosages were quite similar, based on a well-developed rapeseed in autumn[3].

Since a few years we are discussing now the advantage of TuYV hybrids and their yield potential in the European trials. Next to the already explained additional growth boost in autumn time, we observe another key feature, if we compare the nitrogen efficiency of conventional hybrids vs. TuYV resistant varieties.

The graph No. 3 below is presenting the yield results of 2018 & 2019 in dependence of selected nitrogen variants. We recognize a clear yield effect of TuYV genetic, which shows a significant advantage especially under difficult conditions (120 kg N/ha). Based on the tough weather conditions in 2018, respectively 2019 with a tough start in autumn (2017: wet; 2018: dry), respectively tricky emergence and the dry spring with hot temperatures later on in summer we can observe that the modern hybrids with TuYV reached even with 120 kg N/ha a higher yield result than conventional hybrids with 180 or even 240 kg N/ha. Thus, the new generation set up a better nitrogen efficiency and offer a new chance to the farmers to solve the restricted nitrogen fertilization, which will come more and more soon.

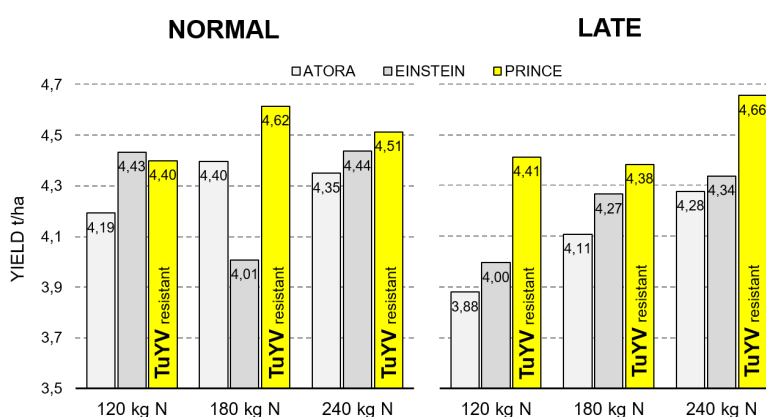


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It becomes more interesting, if we take next to the nitrogen dosage also the sowing date into consideration. The graph below shows the results for our conventional hybrids ATORA & EINSTEIN vs. our TuYV newcomer PRINCE, based on the summary of our trials from 2018, respectively 2019. PRINCE belongs together with TEMPTATION, DOMINATOR or KELTOR to our promising powerful RAPOOL TuYV pipeline.

We can recognize that PRINCE shows a high yield stability and especially for the late sowing dates a better yield potential. This effect is extremely visible if we combine the results of 120 kg N/ha with late sowing. This combination brings the tested varieties to their limits and shows the genetic potential under the already mentioned tough weather conditions in 2018 & 2019.

We can summarize, that the experiments were conducted in two different years with various conditions during plant emergence. The sowing season in 2017 was exceptionally wet, which boosted the growth. The plants developed a shallow root system. In 2018 sowing and emergences took place during an exceptional drought. It delayed the emergence, but therefore the plants developed deeper taproots. The statistical analysis presented the sowing date is significant and delay in sowing (14 days) leads to a yield reduction (4,4 t/ha in normal sowing vs. 3,8 t/ha at late sowing). However, in case of water deficit during the sowing time it is worth to wait with the sowing ("seedbed before seed date") and to choose the right variety with good initial vigor and TuYV resistance, which is offering an additional growth boost, confirmed by the results from 2018.



In case of the variety PRINCE, it should be noted that the fertilization variant of 120 kg N/ha reached similar yield to the variant of 180 kg N/ha. It enables to reduce the costs, by keeping a high yielding level. Healthy varieties allow for more efficient use of absorbed unit of nitrogen and this translates into the economic effects of the cultivation.

The new results of 2019 give already a first indication, that the success of the new TuYV generation is ongoing, because with DOMINATOR (TuYV + APR37 against Phoma lingam) the next TuYV hybrid was dominating the different trial issues last year. In comparison with another strong competitor (TuYV resistant) DOMINATOR convinced with a yield plus of 0,6 t/ha in the 120 kg N/ha variant, respectively with a yield plus of 0,8 t/ha in the variant of 180 kg N/ha, stable over both sowing dates.

These new promising candidates like TEMPTATION, KELTOR, PRINCE or DOMINATOR extend our portfolio and improve the rapeseed production technology, respectively offer more solutions for the future challenges.

Dr hab. Witold Szczepaniak, Chair of Agricultural Chemistry and Environment Biogeochemistry, Poznań University of Life Sciences

Artur Kozera, Product Manager Rapool Polska sp. z o.o.

Rene Brand, International Product manager of Rapool

[1] Source: Entrup & Oehmichen – Textbook of crop production, edition 2: crops (2000), page 530 ff.

[2] Source: Rapool – internal data

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[3] Source: Sieling, Sauermann, Kage; UFOP – trial to optimize the N fertilization; N = 12 trials (2006 – 2009)