

Proc. 430: Comparisons Between Different Sources of Phosphate Applied Directly to Soil and via Fertigation

by Leena Ristimäki.

Discussion following presentation of the Paper:

Nick Douthwaite, *European Fertiliser Manufacturers Association (EFMA), Brussels:*

We heard a lot this morning about the use of fertilisers to optimise crop yields. I wonder if you could expand a little bit on the use of some of these techniques to optimise measurable quality parameters, particularly in food crops.

Leena Ristimäki:

Yes, we have also measured quality, although I showed here mainly the crop yield results. We have measured some quality parameters on potatoes for example, which I think are in the paper. We have measured dry matter content, nitrate content and compared specific gravities, using different products. We have also measured some other quality parameters, but in general if the fertigation is managed properly the quality is also better.

Josef Hagin, *Technion IIT, Israel:*

Not a question really, but I would like to recall that at the beginning you emphasised that fertigation cannot work if there is not good background information. I would like to emphasise this, given an opportunity to repeat things that I have already said, that in order for fertigation to work you have to have first of all a good research background. I mean you need to know the uptake curves of nutrients for the major crops that you are treating, and you need a research organisation for that. Secondly, you need to have a good fertiliser industry which is able and willing to supply a great variety of fertilisers for fertigation. If that doesn't exist, again it cannot work. And then you have to have a good extension service as you already mentioned several times, that can bring it to the growers, to the farmers. And finally you have to have technologically addicted growers who will do the fertigation! If they are not well into the technology, including computers, it won't work.

Leena Ristimäki:

I totally agree.

Tore Frogner, *Norsk Hydro AS, Oslo, Norway:*

In Hydro we do not produce urea phosphate but we see this as an interesting product. When using this in fertigation what is the effect of the urea, and thus ammonium, into these systems, because we know that in fertigation in greenhouses you need to have a balance between nitrate and ammonium nitrogen.

Leena Ristimäki:

Urea phosphate is only one raw material and normally when it is used it's not used alone. It is always mixed with potassium nitrate or ammonium nitrate, as it was in these trials. In these NPK products it's always a mixture of different nitrogen forms, so it's never urea alone; it's always urea, ammonium and nitrate. It's an important point, but in some products we pay more attention to that nitrogen type balance than in others, but in many cases the acidity is the main things - to create as acidic a product as possible. I think that in the future we will have to pay more attention to this nitrogen type balance.

Avi Shaviv, *Technion IIT, Israel:*

I actually wanted to elaborate about this issue of ammonium:nitrate proportions. Considering the ammonium:nitrate proportion in your UP, the ammonium to P ratio was higher than in the other fertilisers that you compared. In calcareous soils the effect of ammonium acidification due to the uptake by plants and excretion of protons into the rhizosphere plays an important role so probably one has to take that into account. The ratio of ammonium to nitrate - the whole ratio in the system - and the ratio of ammonium to P will probably also have to do with improving the uptake of phosphorus. On the other hand in the system that you are mentioning - the detached beds in which the medium is inert - then of course you cannot introduce urea and you have a problem.

Leena Ristimäki:

This is correct of course. We have in the product group one product which is used for hydroponics and there is no urea phosphate in that, for this reason.

Reinhardt Haehndel, *BASF, Limburgerhof, Germany:*

A small technical question. In one of your first results you presented on tomatoes you showed that fertigation gave a much much higher yield than did solid fertilisers. How did you apply the solid fertilisers? Was it spread over the whole surface or was it in row application?

Leena Ristimäki:

It was applied in bands. It was applied so that the fertiliser was mixed slightly with the moist soil, but not so that the plant root directly touched the fertiliser. The trial was not for a full season, although we actually wanted to have five months production. We couldn't have that because we would have had to apply so much fertiliser at the beginning that it would have been too much for the plant to stand.

Reinhardt Haehndel, *BASF, Limburgerhof, Germany:*

You had different nutrient levels?

Leena Ristimaki:

No we had the same nutrient level for all the treatments. However because we could not apply the full quantity at the beginning which would normally be required for a five month crop, the rates of all the fertilisers applied were reduced proportionally. So all the treatments received the same quantities of nutrients.

Ron Seligmann, Norsk Hydro AS, Oslo, Norway

You were referring to a higher N efficiency, especially with fertigation. How were the amounts of fertiliser to be applied calculated? Was it according to crop demand? Was there any monitoring of leaching?

Leena Ristimaki:

The fertiliser applied in these trials was according to the current local recommendation based on research done in Cyprus. They started fertigation research on different crops 25 years ago and these trials were conducted by the Agriculture Research Institute in Nicosia. They consider the soil to be effectively inert, saying that it is basically so bad that without fertigation it couldn't be used at all. They consider that they actually get nothing except calcium from the soil.

Ricardo Behn, SQM, Antwerp, Belgium:

It is pretty surprising to have these results that the lower dosage gave higher yields. You mentioned that 75% of the recommendation was given. What is this recommendation based on? It may be that the ideal recommendation is the 75%.

Leena Ristimaki:

Further to what I said before, I can tell you for example that for tomatoes the recommendation is to apply 300 kg of nitrogen, 94 kg phosphorus (as the element) and 470 kg of potassium (as the element), and I think these are quite close to your local figures. I would think that they are quite reasonable recommendations. But the question is valid.

Further question:

In some way this recommendation is also linked to yields. Depending on the yields you want to achieve would you make a different recommendation, avoiding standard recommendation for any kind of yield?

Leena Ristimaki:

Correct. We are building up recommendations based on real yield levels. The yield very much influences the recommendation. If you are aiming at a yield of 50 tonnes of tomatoes, the recommendations are certainly different from those for a 100 tonne crop. I think that these recommendations are based on the average yield level in Cyprus, which is around 100 tonnes per hectare of tomatoes, for example. We are building up a programme so that we take into account the expected yield levels - for example in some countries they get only

30 tonnes of tomatoes. But in the conditions where the trial was conducted they get a very good yield; for example the potato yield is 60 tonnes per hectare, which is very high for those conditions.

Avi Shaviv, Technion IIT, Israel:

I think I can add to this. I have a feeling that the recommendations there were originally based on TSP or MAP and once you introduce a fertiliser which acidifies the rhizosphere you have to look again and re-assess your recommendation, which is what you did. I would figure that allowing for different conditions you can probably go for much lower P because the use of P is much more efficient.

Leena Ristimaki:

The basic recommendation is based on fertigation, I know. It's not based on soil application of nutrients and it is the level the farmers are using. But I am not saying that it's 100% correct, it can always be improved, but I am convinced that it's based on fertigation research.

Brendan Barnes, Irish Fertiliser Industries, Ireland:

Just a point of clarification really. On the last slide you put up on the comparison of the potatoes, you had 'ordinary NPK'. Can you clarify what you mean by 'ordinary NPK' again? Is it a blend of DAP, TSP or is it a phosphoric acid compound?

Leena Ristimaki:

By ordinary NPK I mean agricultural NPK, including TSP, potassium chloride, and not necessarily 100% water soluble.

The Chairman thanked the speaker for the paper and the discussion.