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RATE AND PLACEMENT FOR THE ENHANCED USE OF CRF IN VEGETABLES

Adriano ALTISSIMO
Landlab Studio Associato, Italy

International Fertilizer Industry Association

NEW AG INTERNATIONAL

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Rate **and** ***placement*** **for the enhanced use of** ***CRF*** **in vegetables**

Adriano Altissimo
Massimiliano de Antoni Migliorati

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Nutrition problems: ***Precise Rate***

"…it is extimated that nearly 5-21% of the photosintetically fixed carbon is eventually transferred to the rhizosphere in the form of root exudates…"

Nardi, Pizzeghello – Agricolture biotecnology Dept. University of Padua-
"Rhizosphere: a communication between plant and soil", Kerala, India (2004)

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Nutrition problems: ***Precise Rate***

Question:

When CRF or CRF blends can be more efficient than other fertilization techniques?

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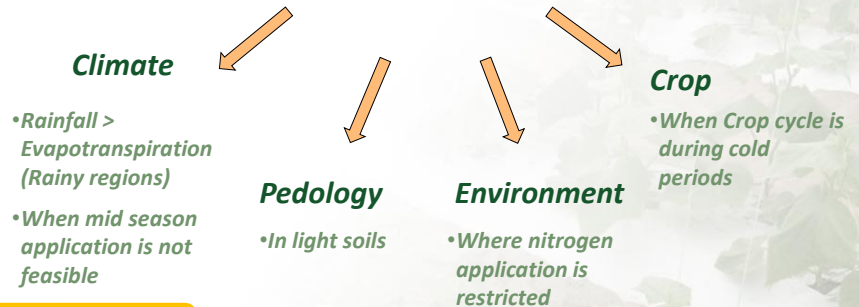
Nutrition problems: Precise Rate

Answer:

I.e. when fertigation is not convenient for several reasons:



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Nutrition problems: Precise Rate

An example: Almeria region (Spain)

27.000 ha of plastic greenhouses, all using fertigation

5.000 (20%) have soil-less with free drainage

Nutrition problems: Precise Rate

Do we really know Nutrigation side effect?

25-30% of applied water is drained to prevent salt accumulation

The piezometric level is rising by 0,5 m per year

Treatment	Average drainage NO_3^- concentration (mg NO_3^- /L)	Average drainage fraction (%)	Average amount of N leached (Kg NO_3^- – N/ha)
Crop in soil	550	28	111
Crop in substrate	910	31	238

A. Lopez-Fèrnandez et al., 16th Nitrogen Workshop, Italy 2009

Nutrition problems: Precise Rate

Comparing fertigation to *CRF*…

Greenhouse-grown tomatoes

Treatment	Fertilizer	kg/ha			Application
		N	P_2O_5	K_2O	
Farmer's practice	Liquid	660	240	840	Nutrigation at 2-days intervals
CRF 50% FP	CRF 16-8-26 (90-0-100% coated) Longevity: 6 months	264	132	429	Base-dressing, irrigation schedule same as in Farmers practice
CRF 65% FP		432	216	702	

	Total yield (T/ha)	Marketable yield (T/ha)	Mean fruit size (g)
Farmer's Practice	126.72 a	111.23 a	166 a
CRF 50% FP	124.89 a	109.97 a	173 b
CRF 65% FP	140.16 b	126.83 b	171 b

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HaBesor Farm, Israel

Nutrition problems: Precise Rate

Removal = part of the plant removed by harvest

Fertigation	kg/ha		
	N	P_2O_5	K_2O
Fruit	189	60	265
Leafs	204	65	286
Stem	44	14	61
Roots	30	10	42

CRF 50% FP	kg/ha		
	N	P_2O_5	K_2O
Fruit	188	60	263
Leafs	203	65	284
Stem	44	14	61
Roots	30	10	42

	Fertilizer applied (kg/ha)			Total yield (T/ha)	Marketable yield (T/ha)	Mean fruit size (g)
	N	P_2O_5	K_2O			
Farmer's Practice	660	240	840	126.72 a	111.23 a	166 a
CRF 50% FP	264	132	429	124.89 a	109.97 a	173 b

The remarkable result: same removal (189 vs 188 kg/ha) with 1/3 of applied N (660 vs 264 kg/ha)

N excess*: in the soil and/or leached** → ***660 – 189 = 471 kg/ha; ***264 – 188 = 76 kg/ha !***

Nutrition problems: Precise Rate
(assuming that soil fertility won't been depleated)

What has to be taken in account for plants feeding:

- ***Removed***
- ***Fertilizer inefficiency / losses***

↓

From 5% (CRF) to 50% (Urea)

↓

Depending on application ***time*** and ***location***

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Nutrition problems: Temperature

Temperature: leading factor for

- ***Growth***
- ***CRF nutrients release***

In moisty soils temperature is around 25-30° C (in summer/greenhouses)

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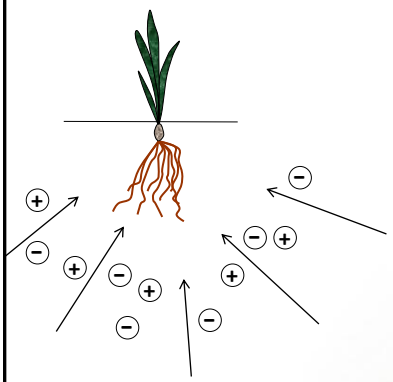
Nutrition problems: Ions migration



Plants stimulate ions migration

If ion's speed is slower than plant demand

→ ***nutrition deficiency***

If distance is too high

→ ***nutrition deficiency***

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Nutrition approach: Precise Placement

Question:

How can CRF be distributes in efficient way?

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Nutrition approach: Precise Placement

Seeded Crops
(cereals)

Banding
Semi banding
Double banding

Transplanted Crops
(vegetables)

Banding
Semi banding
Double banding

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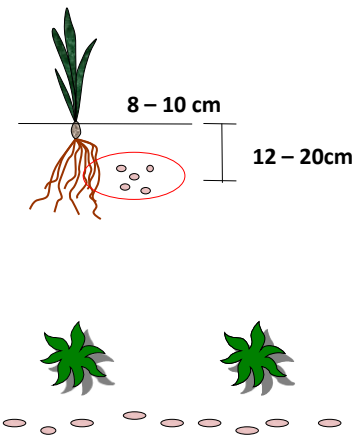
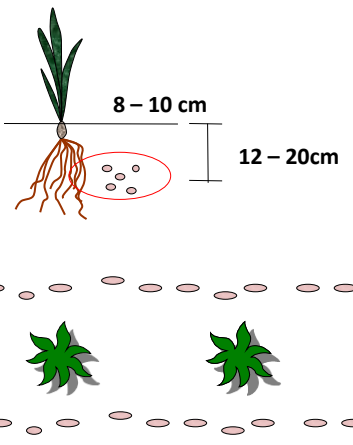
Nutrition approach: Precise Placement

Banding

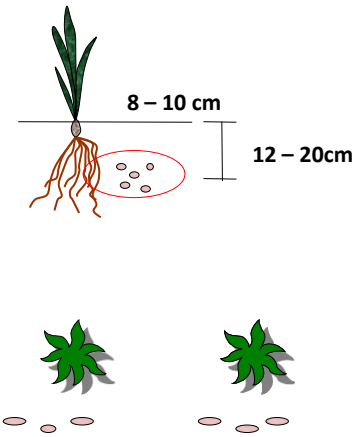


Double - banding

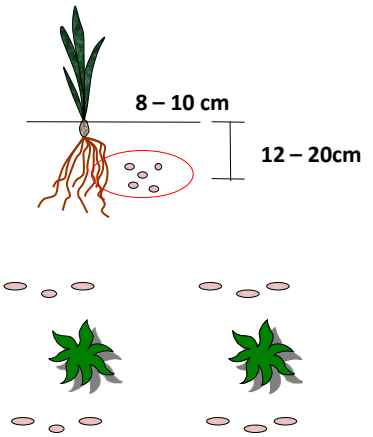


Nutrition approach: Precise Placement

Semi-banding

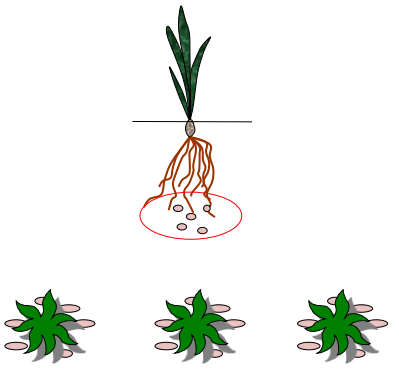


Double – Semi banding



Nutrition approach: Precise Placement

Nesting



Nutrition approach: Precise Placement

Nesting

Nutrition approach: Precise Placement

Let's see some trials result…

2008 - 2009

Nutrition problems: Precise Placement

Experiments in Advanced Nesting system on CRF and CRF's blends

Species : Eggplant

Year: 2008

Fertilizer type: N-P-K fully coated (Haifa MULTICOTE)

Nutrient level :
1 level - 70% of the farmer practice

Nutrition plan :

Kg/ha	Eggplant		
	N	P_2O_5	K_2O
100	180	84	180
70	126	59	126

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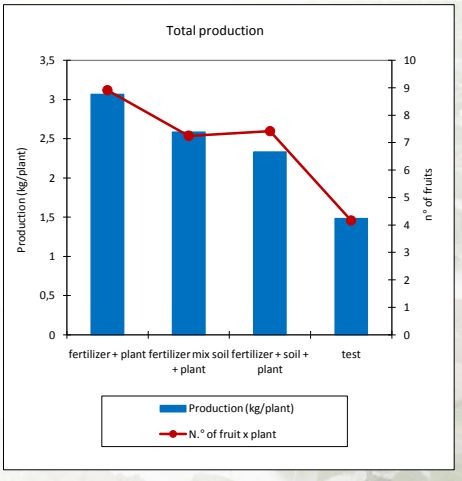
Nesting: Summer species (Eggplant, 2008)

	Production (kg/plant)	
fertilizer + plant	3	a
fertilizer mix soil + plant	2.6	a
fertilizer + soil + plant	2.3	ab
test	1.5	b

	N of fruit per plant	
fertilizer + plant	9	a
fertilizer mix soil + plant	7.4	ab
fertilizer + soil + plant	7.3	ab
test	4.2	b



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Using 100% of coated products confirms that the placement techniques has an affect on the NUE

Nesting: Summer species (Eggplant, 2008) with fully-coated fertilizers

Summer species:

- *Trials on eggplant clearly showed that it is possible, with this technique, to apply a nutrient level of 70% of the Farmer Practice and have a good production*
- *All the plants were alive and arrive at the end of the cycle, so no problem of excess of salinity using 15.7.15 8 months*
- *The better method was the Hole>Fertilizer>Plant, which is, moreover, the one that fits with a future mechanization of the process:* ***NESTING***

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Nesting: fully-coated fertilizers

It's clear that fully-coated N-P-K fertilizers have some vices:

- *They are expensive*
- *N-P-K ratio is fixed*
- *Release curve not changeable*

⇩

- *Is not adaptable to all crops!*

Other series of trials testing <u>Coated/Uncoated Blends</u>

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Nesting: Autumn-Winter species

Species : Cauliflower, Cabbage, Chicory

Year: 2008

Fertilizer : ***blends*** of 8-4 months release fertilizers (Haifa MULTICOTE) with different ratio Coated/Uncoated (0-100; 33-66; 66-33; 100-0)

Entries :

1 level - 70% of the farmer practice with different blend

2 test- 100% and 70% of farmer practice (ammonium nitrate, K sulphate, simple P)

1 test - no fertilization

Technique : *Hole>Fertilizer>Plant:* ***Nesting***

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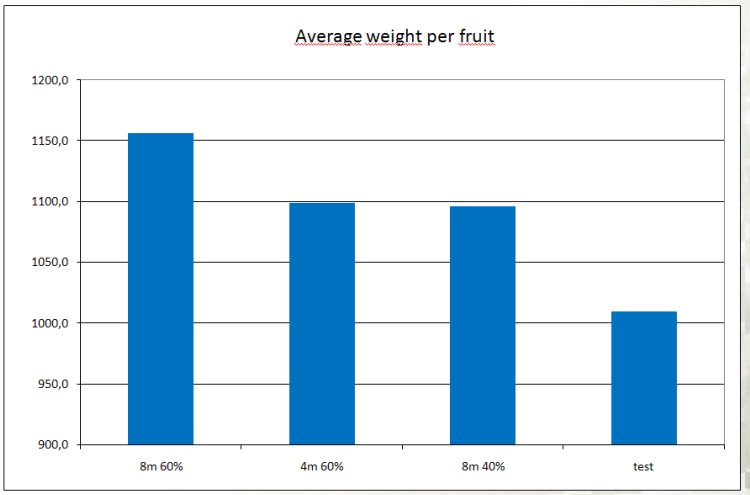
Nesting: Autumn-Winter species



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Best performances: 8 months C/UC blend

Nesting: Autumn-Winter species

Nesting

In this case too has been highlighted the efficiency in using Nesting techniques with Coated/Uncoated blends of N-P-K

Nesting: 2009 trials

Nesting

After studing Nesting performances in cold-cycle crops, investigation on warm-cycle crops.

Several experieces in Australia, Israel, Italy, … make possible to widen the use of Coated/Uncoated blends

The outcome:

Trials 2009

Model plant: Eggplant

Nesting: 2009 trials

Eggplant 2009

% Coat (N-P-K)	Average weight/plant (kg)	
TEST	1,8	a
FERTIGATION	2,0	b c
BROADCAST	2,1	b c
100% coat (av. banding-nesting)	2,4	c
75-0-25 (av. banding-nesting)	2,4	c
33%coat (av. banding-nesting)	2,4	c
66% coat (av. banding-nesting)	2,4	c
100-10-50 (av. banding-nesting)	2,5	c

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Nesting: 2009 trials

Eggplant 2009

Application Type	Average weight/plant (kg)
BAND	2,27
NESTING	2.55

Application Type	% Coat (N-P-K)	Average weight/plant (kg)	
BAND	100-10-50	2,2	a
BAND	33% coat	2,2	a
BAND	75-0-25	2,3	a
BAND	66% coat	2,4	ab
NESTING	66% coat	2,4	ab
NESTING	75-0-25	2,5	ab
NESTING	33% coat	2,5	ab
NESTING	100-10-50	2,8	b

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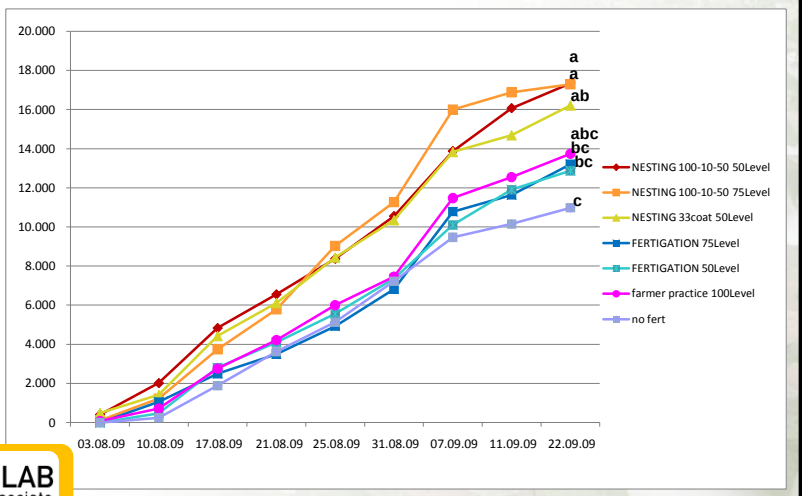
Nesting vs Fertigation and FP

Type of application x type of fertilizer x nutrients level: some entries

g/fruit/plot



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Conclusions (1/3)

In soil **cultivations:**

In several situations fertigation is not possible/convenient

In other cases at the base of fertigation techiques there is the ***assumption*** *that plants in that moment need what we are giving to* them

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Conclusions (2/3)

On the other hand CRF blends …

- Permit to create a nutrient stock in the immediate rootzone
- Reduce the energy required by the plant to find nutrients into the soil (uptake – intake; see Nardi et al.)
- Minimize losses
- Optimize plant phisiology and its productive response

So…

*It's better to decide **by ourself** WHEN plants need fertilizer (fertigation)*
*or let the **plants** do decide WHEN they need fertilizer…?*

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Conclusions (3/3)

The CRF system is flexible and adaptable

… because it allows to vary:

- the N-P-K ratio for each crop
- the Coated/Uncoated ratio for each crop cycle (warm-cold), soil type and climate condition (rainfall regime);
- dosing in relation to field fertility variations (precision agricolture)

Moreover…
- Can be easily adjusted with foliar nutrition
- It's environmentally friendly
- Reduces costs

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Thank you for the attention

a.altissimo@landlab.net

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