

The effect of PSP on different crops

INTRODUCTION

Hello Nature uses high quality organic ingredients to create PSP, a pure vegetal protein hydrolysate containing Plant Stimulating Peptides. The all-natural organic formula comes as a liquid, is suitable for organic farming, and is the ideal partner to implement sustainable agricultural practices.

Investigations of label claims that the use of PSP improve the Nutrient Use Efficiency (NUE) of Nitrogen on Broadacre crops, Vegetables, Ornamental and AMP, Woody Perennials were made, and the PFP (Partial Factor Productivity) was calculated.

MATERIALS AND METHODS

5 trials (internal research) between 2018 and 2021 were conducted in Europe (France) using small plot field trials to check the PSP effect on nutrient use efficiency of Nitrogen. Strips were arranged in a randomized complete block (RACOB) design with 4 replications for each trial. There is one site-years/trials. Data were analyzed using standard deviation and the statistical metric that was used to show significance is the p-value (LSD P=0.15). Where significance existed, means were compared using Student-Newman-Keuls statistical test.

TRIAL 1 - IT1401 (PSP) ON WOODY PERENNIALS (APPLE)

In 2021, a trial was conducted on apple trees (Gala) planted in 1998. Individual plot size was 4 m width and 7.5 m length, with 5 plants per plot. The soil is composed of limestone clay (see Table 1). The tillage is conventional, and irrigation is by drip system. A control is used to check the efficacy of the biostimulant (IT 1401 – PSP). No positive or negative control is used.

Prior to planting, the entire experimental area including the control was treated in spring (10th march) with 800 kg/ha of ITALPOLLINA (4-4-4), and 700 kg/ha of NASKAR (12-5-15) after flowering (30th April). Total fertilizer treatment to all of the plots was therefore 116 kg N/ha.

Growing season temperature and precipitation are presented in Figures 1 and 2. Similar average growing season air temperatures and precipitations were observed compared with the 30-yr normal (Table 2).

The various treatments applied supplementally by foliar application to the fertilizer area were (see figure 3):

- Modality 1: Untreated control (103-204-302-405)
- Modality 2: 3 l/ha early flowering, 3 l/ha end of flowering, and 3 l/ha fruit size up to 10 mm (101-202-304-403)
- Modality 3: 3 l/ha fruit diameter up to 40 mm, 3 l/ha fruit about 70% of final size, and 3 l/ha beginning of ripening (102-205-301-404).

NB: Modalities 4 and 5 are out of scope (using another biostimulant product)

At the end, the yield (t/ha) and the PFP N were measured.

TRIAL 2 - IT1401 (PSP) ON WOODY PERENNIALS (VINE)

In 2020, a trial was conducted on vine (cabernet franc) planted in 1982. Individual plot size was 1 m width and 5 m length, with 5 plants per plot. The soil is composed of clayey sand (see Table 1). The tillage is conventional without irrigation. A control is used to check the efficacy of the biostimulant (IT 1401 – PSP). No positive or negative control is used.

Prior to planting, the entire experimental area including the control was treated in spring (25th march) with 500 kg/ha of PHENIX (6-8-15). Total fertilizer treatment to all of the plots was therefore 30 kg N/ha.

Growing season temperature and precipitation are presented in Figures 4 and 5. Similar average growing season air temperatures and precipitations were observed compared with the 30-yr normal (Table 3).

The various treatments applied supplementally by foliar application to the fertilizer area were (see figure 6):

- Modality 1: Untreated control (102-201-304-403)
- Modality 2: 3 l/ha early flowering, 3 l/ha end of flowering (105-202-305-402)
- Modality 3: - 3 l/ha at berries pea-sized, 3 l/ha at majority of berries touching, and 3 l/ha softening of berries (103-205-303-404).

NB: Modalities 4 and 5 are out of scope (using another biostimulant product)

At the end, the 200 berries weight and the PFP N were measured.

TRIAL 3 - IT1401 (PSP) ON VEGETABLE CROPS (ORGANIC CAULIFLOWER)

In 2018, a trial was conducted on organic cauliflower planted in April 2018. Individual plot size was 1.5m width and 10 m length, with 35 plants per plot. The soil is composed of clay (see Table 1). Plow tillage system is used, without irrigation. A control is used to check the efficacy of the biostimulant (IT 1401 – PSP). No positive or negative control is used.

Prior to planting, the entire experimental area including the control was treated with 1000 kg/ha of ITALPOLLINA (4-4-4), and 1300 kg/ha of PHENIX (6-8-15). Total fertilizer treatment to all of the plots was therefore 122 kg N/ha.

Growing season temperature and precipitation are presented in Figures 7 and 8. Similar average growing season air temperatures and precipitations were observed compared with the 30-yr normal (Table 4).

The various treatments applied supplementally by soil and foliar applications to the fertilizer area were (see figure 9):

- Modality 1: Untreated control (105-203-302-403).
- Modality 2: 5 L/ha post planting date (23-04) on the soil (104-205-303-401).
- Modality 3: 5L/ha 1 month after planting date (25-05) and 5 L/ha during cauliflower induction (8-06) by foliar application (102-201-305-404).

NB: Modalities 4 and 5 are out of scope (using another biostimulant product)

At the end, Marketable and unmarketable weight and the PFP N were measured.

TRIAL 4 - IT1401 (PSP) ON BROADACRE (CORN)

In 2019, a trial was conducted on corn sown the 27 March 2019. Individual plot size was 4 m width and 6 m length. The soil is composed of calcareous clay (see Table 1). Plow tillage system is used, with water canon irrigation. A control is used to check the efficacy of the biostimulant (IT 1401 – PSP). No positive or negative control is used. The entire experimental area including the control was treated with 245 kg/ha of Nitrogen.

Growing season temperature and precipitation are presented in Figures 10 and 11. Similar average growing season air temperatures and precipitations were observed compared with the 30-yr normal (Table 4).

The various treatments applied supplementally by foliar applications to the fertilizer area were (see figure 12):

- Modality 1: Untreated control (105-203-302-401).
- Modality 2: 3 L/ha at 4 true leaves unfolded (102-201-303-405).
- Modality 3: 6 L/ha by foliar application at 4 true leaves unfolded (104-202-304-402).

NB: Modalities 4 and 5 are out of scope (using another biostimulant product)

At the end, the yield and the PFP N were measured.

TRIAL 5 - IT1401 (PSP) ON BROADACRE (WHEAT)

In 2019, a trial was conducted on corn sown the 03rd of October 2018. Individual plot size was 4 m width and 6 m length. The soil is composed of silt (see Table 1). Plow tillage system is used, without irrigation. A control is used to check the efficacy of the biostimulant (IT 1401 – PSP). No positive or negative control is used. The entire experimental area including the control was treated with 208 kg/ha of Nitrogen.

Growing season temperature and precipitation are presented in Figures 13 and 14. Similar average growing season air temperatures and precipitations were observed compared with the 30-yr normal (Table 6).

The various treatments applied supplementally to the fertilizer area were (see figure 15):

- Modality 1: Untreated control (103-204-303-402).
- Modality 2: By soil application in association with UAN (2 applications) at the dose of 1.5 l/ha per application (104-202-301-405).
- Modality 3: By foliar application (2 applications) at the dose of 3 l/ha per application (100-203-304-403).

NB: Modalities 4 and 5 are out of scope (using another biostimulant product)

At the end, the yield and the PFP N were measured.

RESULTS AND DISCUSSIONS

TRIAL 1 - IT1401 (PSP) ON WOODY PERENNIALS (APPLE)

The results were shown in tables 7 and 8.

Different letters indicated significant difference at P=0.15.

Modality 1 is alone in the class c.
Modality 2 is in the class b.
Modality 3 is in the class a.

This shows:

- PSP (IT 1401) improves the yield and PFP N whatever the stage application.
 - The last 3 applications (modality 3) better improve the yield and PFP N than the first one (modality 2).
- IT1401 improved the PFP of nitrogen by the apple, so the uptake of it and the NUE.

TRIAL 2 - IT1401 (PSP) ON WOODY PERENNIALS (VINE)

The results were shown in tables 9 and 10.

Different letters indicated significant difference at $P=0.15$.

Modality 1 is alone in the class c.
Modality 2 is in the class b.
Modality 3 is in the class a.

This shows:

- PSP (IT 1401) improves the 200 berries weight and PFP N whatever the dose and stage application.
 - The last 3 applications (modality 3) better improve the 200 berries weight and PFP N than the first one (modality 2).
- IT1401 improved the PFP of nitrogen by the vine, so the uptake of it and the NUE.

TRIAL 3 - IT1401 (PSP) ON VEGETABLE CROPS (ORGANIC CAULIFLOWER)

The results were shown in tables 11 and 12.

Different letters indicated significant difference at $P=0.15$.

Modality 1 is alone in the class c.
Modality 2 is in the class b.
Modality 3 is in the class a.

On both weight (marketable or unmarketable), we see a statistical difference between modality 1 and all the other modalities.

This shows that whatever when and how PSP is applied, it improves the yield of the cauliflower (marketable or unmarketable).

The PFP (Partial Factor Productivity) was calculated on nitrogen. This is the harvest (in kg) product per kg nutrient applied. It shows a statistical difference between the treatment without (1) and with (2 and 3) biostimulant.

IT1401 improved the PFP of nitrogen by the cauliflower, so the uptake of it and the NUE.

TRIAL 4 - IT1401 (PSP) ON BROADACRE (CORN)

The results were shown in tables 13 and 14.

Different letters indicated significant difference at $P=0.15$.

Modality 1 is alone in the class b.
Modalities 2 and 3 are in the class a.

This shows:

- PSP (IT 1401) improves the yield and the PFP N whatever the dose applied.

The dose doesn't influence the level of the result (modalities 2 and 3 in class a).

IT1401 improved the PFP of nitrogen by the corn, so the uptake of it and the NUE.

TRIAL 5 - IT1401 (PSP) ON BROADACRE (WHEAT)

The results were shown in tables 15 and 16.

Different letters indicated significant difference at $P=0.15$.

Modality 1 is alone in the class b.

Modalities 2 and 3 are in the class a.

This shows:

- PSP (IT 1401) improves the yield and the PFP N whatever the dose applied.

The dose doesn't influence the level of the result (modalities 2 and 3 in class a).

IT1401 improved the PFP of nitrogen by the wheat, so the uptake of it and the NUE.

CONCLUSIONS

Efficacy of the PSP was demonstrated for each crop group (broadacre crops, woody perennials and vegetables, ornamental and AMP). PSP (IT 1401) improves the yield and PFP N, so the uptake of it and the NUE.

Tables and Figures

Below is the list of appendices.

The data is confidential and is not publicly available.

Table 1: Soil conditions of trials

Figure 1: 30 Years average temperature in comparison with the trial 1

Figure 2: 30 Years average precipitation in comparison with the trial 1

Table 2: Weather summary of trial 1

Figure 3: Trial 1 Map treatment Description

Figure 4: 30 Years average temperature in comparison with the trial 2

Figure 5: 30 Years average precipitation in comparison with the trial 2

Table 3: Weather summary of trial 2

Figure 6: Trial 2 Map treatment Description

Figure 7: 30 Years average temperature in comparison with the trial 3

Figure 8: 30 Years average precipitation in comparison with the trial 3

Table 4: Weather summary of trial 3

Figure 9: Trial 3 Map treatment Description

Figure 10: 30 Years average temperature in comparison with the trial 4

Figure 11: 30 Years average precipitation in comparison with the trial 4

Table 5: Weather summary of trial 4

Figure 12: Trial 4 Map treatment Description

Figure 13: 30 Years average temperature in comparison with the trial 5

Figure 14: 30 Years average precipitation in comparison with the trial 5

Table 6: Weather summary of trial 5

Figure 15: Trial 5 Map treatment Description

Table 7: Standard deviation of the trial 1

Table 8: Yield (t/ha) and PFP N of the trial 1

Table 9: Standard deviation of the trial 2

Table 10: 200 berries weight (g) and PFP N of the trial 2

Table 11: Standard deviation of the trial 3

Table 12: Marketable and unmarketable weight (kg) and PFP N of the trial 3

Table 13: Standard deviation of the trial 4

Table 14: Yield and PFP N of the trial 4

Table 15: Standard deviation of the trial 5

Table 16: Yield and PFP N of the trial 5