trial report results from

Iraq

LLU Agency

AGRICULTURE SCIENTIFIC INSTITUTE

REPORT ON TRIALS

On the topic

EFFECT OF BIODEPOSIT® AGRO ON THE GROWTH AND DEVELOPMENT OF PLANTS

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Introduction

In summer 2010 the company SIA EHT ENGINEERING offered BioDeposit® Agro (produced by ECO ORGANICA) to the Agriculture Scientific Institute, and express laboratory trials were carried out at their initiative to identify the effect of BioDeposit® Agro on early development of plants suitable for lying of lawns (carpet-grass) through imitation of their use in the conditions of Iraq. The trials were carried out in several stages during July and August.

Methodic

Summer months of the year 2010 were described by extremely torrid weather, when temperature on a number of days was in the range of +28...+32^{o}C. Trials were carried out in several stages:

1. in glass-house conditions;
2. by placing containers with samples in the Southern part of the laboratory premises;
3. by using the Hotcold GL climate camera of J.P.Select;
4. by arranging 2 trial blocks in the actual conditions of Iraq – in the cities of Kirkuk and Erbil.

Since we had to establish the effect of BioDeposit® Agro in the conditions of Iraq yet virtually no soil of Iraq was available, we selected sandy grit according to the results of laboratory soil tests (a sample of soil from the Kirkuk Park in Iraq was analyzed) and added some BioDeposit® Agro to it.

4 plant species were tested: the species sewn in laboratory conditions in small containers included: pasture ryegrass *Lolium perenne*, annual ryegrass *Lolium multiflorum*, *Festuca ovina*, and *Festuca arundinacea*. Each plant species was sewn on 3 different substrates:

1) Sandy grit + BioDeposit® Agro mixed in volume proportions 1:1;
2) Sandy grit + BioDeposit® Agro mixed in volume proportions 2:1;
3) Sandy grit + BioDeposit® Agro mixed in volume proportions ¾: ¼.

The control sample of *F.ovina* as the least demanding one of the plant species included in the trial was sewn on pure sandy grit without addition of any BioDeposit® Agro.

The quantity of sewn plants was 300 g m^{-2}. Trials were repeated 2 times.

Glass-house conditions were initially used to ensure air temperature similar to the hot climate of Iraq. The containers were placed in glass-house conditions where the air temperature in the upper layer of soil reached +35...+40^{o}C in July when the trials were carried out. Watering was performed two times a day: in mornings and in evenings.

Condition of the plant stand in the containers was subject to repeated assessment according to 10 grade system, taking into consideration density of the stand, its uniformity, intensity of the green color, etc.

Results

The fast-grower species – Lolium multiflorum and Lolium perenne started sprouting on the 3rd – 4th day after sowing already. The fastest sprouting and growth was exhibited by annual ryegrass (L.multiflorum); it had developed in the above-described conditions with sufficient heat and moisture a thick, dense and tall stand that required cutting already one week after sowing. Annual ryegrass (L.multiflorum) was developing stands in all 3 substrate conditions, and their development was quite similar: 8 – 8.5 grades already 7 days after sowing (see Table 1).

Table 1

Assessment of the stands of various plants in substrates with different concentration of BioDeposit® Agro

Variation No 1	Substrate	Plant specie	Assessment of stand in grades (according to 10 grade system)	
			7 days after sowing	17 days after sowing
2	Sandy grit / BioDeposit® Agro (1:1)	*F.ovina*	6.0	9.0
3		*L.multiflorum*	8.0	8.0
4		*L.perenne*	9.0	8.5
5		*F.arundinacea*	3.0	7.5
8	Sandy grit / BioDeposit® Agro (2:1)	*F.ovina*	4.0	8.5
9		*L.multiflorum*	8.0	7.5
10		*L.perenne*	7.5	9.0
11		*F.arundinacea*	3.0	7.0
14	Sandy grit / BioDeposit® Agro (¾: ¼)	*F.ovina*	5.0	8.0
15		*L.multiflorum*	8.5	8.0
16		*L.perenne*	8.0	8.5
17		*F.arundinacea*	4.0	8.0
27	Control – sandy grit	*F.ovina*	4.0	7.0

Assessment of the stands of pasture ryegrass (L.perenne) showed that in the 4th variation with BioDeposit® Agro and grit mixture of 1/1 the stand developed 7 days after the sowing was the most uniform one with the darkest green color that best covered the upper layer of soil (Figure 1). In variations No 10 and 16 the positive effect of BioDeposit® Agro was also demonstrated, yet the plants there were not that dark, the stand was less dense and uniform. It proved the assumption that the given plant species was more demanding in terms of growing conditions, and very susceptible of fertilizer, BioDeposit® Agro in the given case, used in larger doses.

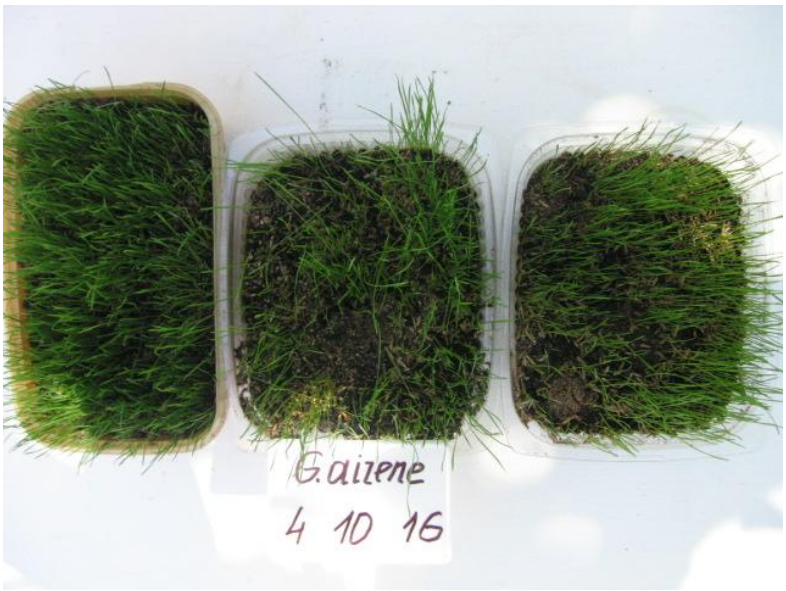

Figure 1. Stand of pasture ryegrass (L.perenne) in substrates with different concentration of BioDeposit® Agro 7 days after sowing.

F.ovina has smaller leaves, and sprouting takes comparatively longer time; it is typical to the given specie, regardless of the type of soil. Figure 2 shows that the grass is finer and it grows longer, so that the upper layer of soil is still clearly visible in all variations 7 days after sowing.

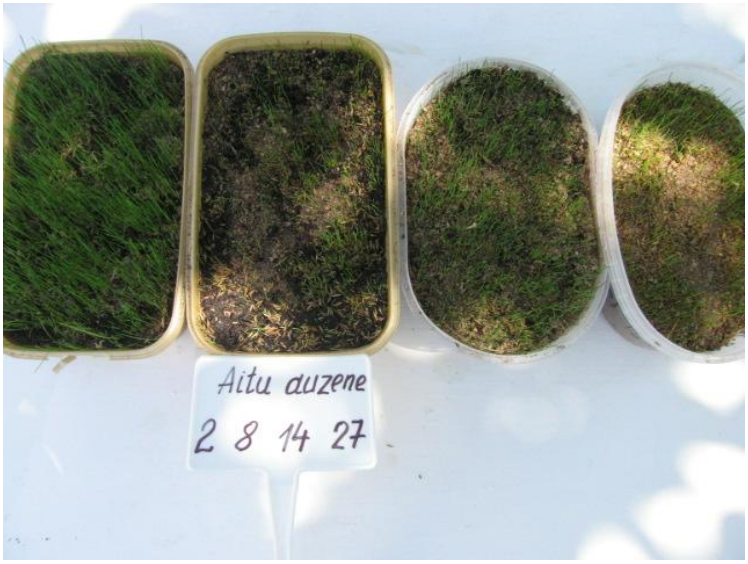

Figure 2. Stands of F.ovina in substrates with different concentration of BioDeposit® Agro and in sandy grit (variation 27) 7 days after sowing.

The non-demanding F.ovina has, however, developed the densest and long stand one week after sowing in variation No 2 with BioDeposit® Agro /grit proportion of 1:1. It shows that it is important for the fine seed of F.ovina to develop in improved conditions of growth in a soil rich in nutritiants and capable of retaining moisture for a longer period of time so that it can better mobilize for sprouting and grow with higher intensity. In variation No 27 where F.ovina was sewn in pure grit sprouting took comparatively longer period of time. This specie of plant is highly undemanding; it adopts to use the smallest reserves of nutritients, therefore it can also grow in poor condition, however sprouting takes longer time and the stand is less saturated, thin and uneven. When the seeds have consumed the internal nutritient reserves differences between variations can be expected to become more explicit.

F.arundinacea also takes long time to sprout; therefore, similar to F.ovina, the plants had hardly started sprouting 7 days after sowing, and no explicit differences between variations could be observed; the stands were assessed a 3 – 4 grades (see Table 1).

Further development of the plants was really fast; they were cut to facilitate development of dense, uniform stands in most variations.

For example, pasture ryegrass (L.perenne) looked quite similar on all substrates 17 days after sowing; it had been growing fast, and by that time all three variations of pasture ryegrass had visually uniform appearance; they had developed even, dense stand in dark green color. The stands continued growing after cutting more than once, and the upper layer of soil was not seen any more in either variation. Pasture ryegrass had filled the whole volume of trial container by its root system, and occasionally it started to sallow due to lack of space for further growth and development. It is explicitly seen from Figure 3 where variation No 4 with the highest

concentration of BioDeposit® Agro displays maximum growing speed of the plants; their root system has notably expanded, so that they lack space to continue their development, and the plants start sicken on one side. Therefore, assessment of the stand in this variation was lower compared to the assessment made 10 years before (Table 1).

Situation would be quite different in natural conditions. Since plants trend to expand their roots deeply into soil, the strong root system would strive in depth to ensure stable growth and provision of nutrients.

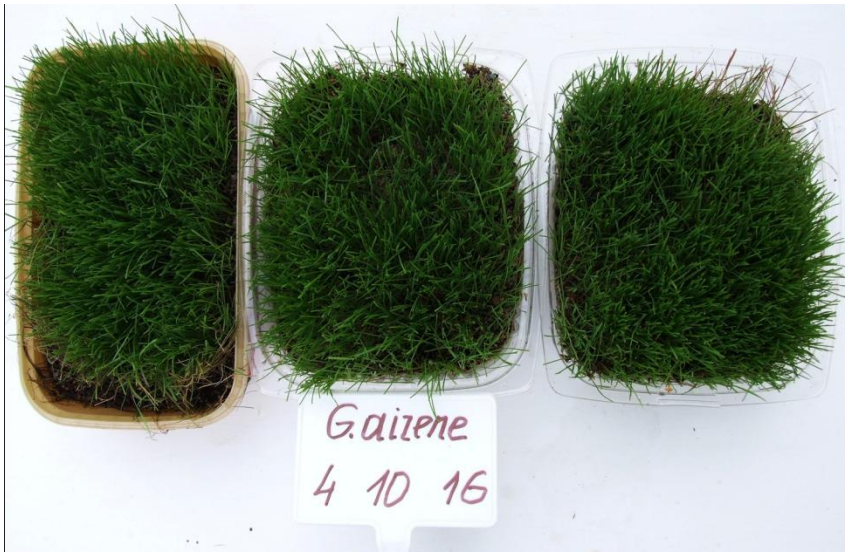

Figure 3. Stands of pasture ryegrass (L.perenne) in substrates with different concentration of BioDeposit® Agro 17 days after sowing.

Situation is different with variations of F.ovina (see Figure 4). Since it takes longer period of time for this plant to grow and develop, 17 days after sowing the plants could have freely grown, expand their root system and, without competing, develop a dense, fine, uniform stand in all variations with the addition of BioDeposit® Agro. Therefore, assessments of the stand had notably improved 17 days after sowing to 8 – 9 grades and, though even there was little difference between them, the trend could be observed that the higher was the added rate of BioDeposit® Agro the more dense and healthy the stand was. The most attractive stand was observed in variation No 2 (BioDeposit® Agro /grit 1:1): it formed dense stand that fully covered the upper layer of soil, and it has healthy appearance and dark green color (Figure No 5).

Figure 4. Stands of F.ovina in substrates with different concentration of BioDeposit® Agro and in sandy grit 17 days after sowing.

The plants of F.ovina in control variation (No 27) with no BioDeposit® Agro addition were notably thinner and paler, and assessment of the stand was only 7 grades (Table 1).

Figure 5. The healthy stand of F.ovina 17 days after sowing in variation No 2 (grit/ BioDeposit® Agro volume rate 1:1).

The effect of BioDeposit® Agro could not be objectively assessed any more while the plants continued growing and developing in the small containers since, as described above in relation to pasture ryegrass, there was too high competition between plants so that the plants started fading off, displaying fawn leaves and occasionally even blank areas. Therefore, once the readily available reserves of nutrients provided by the presence of BioDeposit® Agro in optimum heat and moisture conditions, development reserves of plants in limited space were exhausted. In natural conditions, of course, BioDeposit® Agro would promote vigorous growth and development of strong root system to develop dense, carpet-like stand.

Conclusions

Suitability of BioDeposit® Agro for use in the Iraq conditions

Based on the analysis of soil samples from Iraq performed at the Plant Mineral Fertilizing Laboratory of the Institute of Biology of the University of Latvia, it may be concluded that the soil sample is rich in microelements B, Mn, Cu, S, Mg. It shows especially high saturation of Calcium (Ca) that exceeds the concentration required for lawns 4 – 8 times. It has very high concentration of saline and basic reaction of soil - pH_{KCl} 7.55. The Iraq soil has, however, very low content of Nitrogen (N) and Phosphor (P), and the level of Potassium (K) is also insufficient for growth and development of plants. Iraq soil also contains very few organic matters. Therefore it is necessary to reduce the concentration of saline and to supplement soil with the key nutrition elements – N, P, and K as well as organic matters (humus) facilitating absorption and preservation of moisture in soil to ensure wholesome growth and development of cultivated plants – plants, vegetables, crops, etc. This purpose may be well served by BioDeposit® Agro; agrichemical analysis of BioDeposit® Agro shows that it can be well added to Iraq soil to balance the conditions required for successful cultivation of plants.

Trials conducted in the Iraq conditions demonstrated positive effect of BioDeposit® Agro on sprouting intensity of plants. Compared to the control variation – plants sewn in Iraq soil with no supplements, the presence of BioDeposit® Agro facilitates sooner, more even sprouting and early development of plants.

General conclusions

Results of express trials conducted in small containers showed that addition of BioDeposit® Agro to the Iraq soil and infertile soil selected in Latvia in volume rate of 1/1; 1/3, and 1/4 of volume, respectively, optimum moisture conditions are provided to the plant stands, the soil can keep moisture longer, the seeds give sprouts sooner, and the plants develop more healthy, intensively green stands. The above-described observations have been made in a limited term, however, yet the positive effect of BioDeposit® Agro can be expected to increase along with longer period of growth.

The results of our trials show that, where higher dose of BioDeposit® Agro is added to low fertility soil, the seeds trend to give sprouts sooner and early development of plants is faster, while later the differences between variations with different rate of BioDeposit® Agro diminish since the space for further development of plants is limited to the small containers. The positive effect would be probably more explicit if field cultivation is continued since BioDeposit® Agro would encourage plants to develop stronger root system. It was indirectly observed in variation No 4 of pasture

ryegrass where the volume of roots was not measured while visual observations showed increased growth and development of root system.

In general, plants are comparatively non-demanding, adopted to grow in different circumstances and to use the smallest nutrient reserves. An example to that is F.ovina included in our trials. The results obtained by us are positive; they demonstrate certainly positive properties of BioDeposit® Agro, though field trials should be continued for longer period of time to make grounded conclusions and to develop recommendations for the use of BioDeposit® Agro. The effect of BioDeposit® Agro on growth of plants has to be assessed as well as dynamics of development, intensity of the formation of biomass, and other criteria.

In low fertility soils with exhausted reserves of nutrients and organic matters the use of BioDeposit® Agro as a fertilizer would have valuable effect, in particular in biological farming systems.