On the radiation effect of the Compost preparations

The effect of biodynamic compost preparations on the growing power of wheat

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Since the beginnings of biodynamic farming, understanding biodynamic preparations and their experimental research have been a major scientific challenge. After initial work by KOLISKO (1939) and PFEIFFER (1956), the effect of individual compost preparations was only systematically examined again by GOLDSTEIN and KOEPF (1982) and by HAGEL (1981, 1984/85, 1988). Hagel's question was whether the radiating effect of the preparations described in the "Agricultural Course" by R. Steiner (1924) occurs without direct physical contact with the earth's substrate through the walls of closed glass tubes. He investigated to what extent the compost preparations influence biological processes, such as the microbiological breakdown of organic material (soil respiration) or the growth of plants. In driving force experiments with wheat, he came to the conclusion that plant emergence increased due to the influence of the preparations sealed in glass tubes supported his thesis that the preparations had a radiation effect.

In the scientific discussion about the effects of biodynamic preparations, there have been calls for repeating the tests for reproducibility for some time. It was only in 2005 that it was possible to carry out corresponding experiments as part of a diploma thesis at the University of Oldenburg (Nielebock 2006). These consisted of conducting three driving force tests with wheat with direct and indirect treatment with all and the six individual compost preparations. The test location was the IBDF branch on the Dottenfelderhof. It was examined to what extent an influence of the preparations on the development of seedlings and ultimately the level of driving force can be demonstrated under artificially created stress such as cold or a layer of brick crushed stone. The plants were exposed to the influence of the preparations both directly, when used in the substrate, and indirectly, using closed glass tubes.

Short & sweet

- New experiments should further clarify how the biodynamic preparations work.
- The present work repeats a study of hail, which found radiation effectiveness.
- This could be partially confirmed, but with the opposite effect. direction.

material and methods

The driving force tests were carried out in a two-factor randomized block system with eight repetitions.

Experimental factor I: Application of the six compost preparations yarrow be (SC), chamomile (KA), nettle (BR), oak bark (EI), dandelion (LÖ), valerian (BA) individually and all preparations together (AP), an untreated control (empty tube, KO). In addition, an additional variant with alfalfa hay previously heated to 105°C in glass tubes (KOL) was included as a second control in order to test the possible effect of any organic substance, as in the scientific discussion was repeatedly requested.

Experimental factor II: Type of preparation application: The treatment was carried out on the one hand as a direct, selective addition of the preparations to the soil substrate (contact preparation), and on the other hand they were introduced into the vessels in quartz glass tubes sealed with rubber stoppers (Glass preparation) (Fig. 5). A volume of 0.5 cm^3 was used in each case.

A total of three driving force tests were carried out: a cold test (KT), two brick crush tests (ZGT) according to HILTNER and IHSSEN (1911) in a polytunnel (ZGT-Fh) and in an open vessel station (ZGT-Gs).
In the cold test, which was carried out at 5°C in a dark temperature cabinet, the cold acted as a stress factor, whereas in the brick-crust tests, the covering with a 6 cm high layer of brick-crust acted (Figure 1).
In the first brick test (ZGT-Fh) in March 2005, the seedling

Development is also made more difficult due to naturally low temperatures. The vessels were filled with a sand-earth mixture (2:1) and surrounded with peat or, in the cold test, with peat felt in order to limit any possible radiation effect of the preparations through the vessel walls into the environment. 100 Capo wheat grains were sown per container. The average sprouting time was calculated from the daily recorded emergence rates. After the plants were harvested, the dry matter of the shoots and the ash-free root dry matter were determined.

Results

First of all, when comparing the three driving force tests, it should be noted that the emergence speed of the plants increased significantly with the increase in the average temperature from the cold test to the brick test in the tunnel to that in the container station.

The effects of the preparations were particularly evident on the roots of wheat seedlings. Overall, the ash-free root dry matter tended to decrease by 3 to 7% on average in all three driving force tests with all treatments and both types of preparation. When using bal-drian, yarrow, dandelion and chamomile, the reduction in root mass by 6 to 4% compared to the control with empty glass tubes was statistically confirmed on average for both types of preparation.

When using valerian, the average of the three driving force tests resulted in an increase in the shoot:root ratio due to a greater decrease in root mass compared to shoot mass.

ducks compared to the empty control. When using Valerian in glass tubes, a decrease in root mass of 7% at the significance threshold and a statistically proven increase in the shoot:root ratio of 5% were observed (Fig. 2).

The clearest effects occurred in the cold test. Here, the root mass of the seedlings decreased significantly by 5 to 3% on average across the preparation types for dandelion, yarrow, valerian, chamomile, nettle and oak bark (Fig. 3). While the 7% decrease in root mass for glass-prepared valerian was at the significance threshold when the preparation variants were evaluated separately, a 6% decrease was statistically confirmed for yarrow, oak bark and dandelion under contact preparation. In the ZGT-Fh, this result was confirmed with declines in the root mass of dandelion, yarrow and valerian on average across the preparation types by 7, 8 and 10% (at the significance - threshold). The minor reductions were in the ZGT-Gs of the root mass by 1 to 3% cannot be statistically secured.

The control with substance did not differ significantly in any case - kant from the empty control. On the other hand, there was largely no evidence of drug effects compared to this additional variant.

An exception was significant - kant reduced emergence rates when using nettle (on average for the preparation types) from the 18th to 20th day of the cold test.

When applying stinging nettle, there was also evidence of an effect from closed glass tubes: In the cold test, this application resulted in a delayed emergence rate compared to the control, with a significant increase on average across the preparation types. me of the average shoot time by 3%.

In both preparation variants, this was accompanied by greatly reduced emergence rates from the 17th to 21st day after sowing. The glass-prepared variant showed a more significant delay in emergence: on the 19th day after release

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Fig. 1
Wheat seedlings in the brick-dust test (Photo: N. Lorenz)

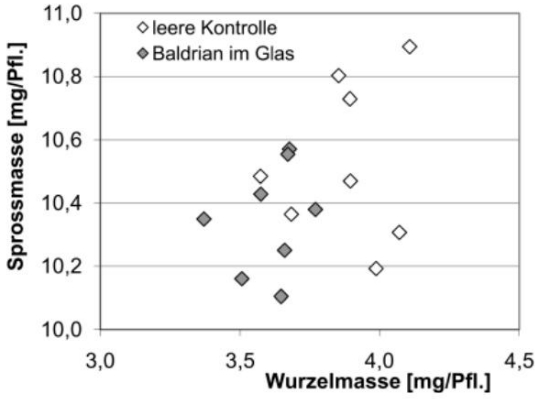

Fig. 2: Effect through the glass? Shoot and root mass (mg DM/plant) of winter wheat on average from three driving force tests depending on the use of the valerian preparation in closed glass tubes, Dottenfelderhof 2005.

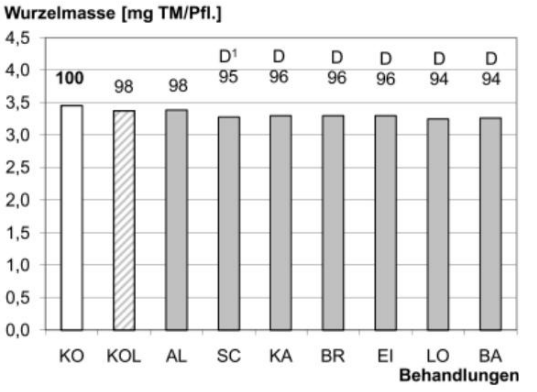

Fig. 3: Slowed root growth: root mass (ash-free DM, mg/plant) of winter wheat in the cold test depending on the use of biodynamic compost preparations, Dottenfelderhof 2005.
1 D: Dunnett a 0.05, significantly different from the empty control (KO)

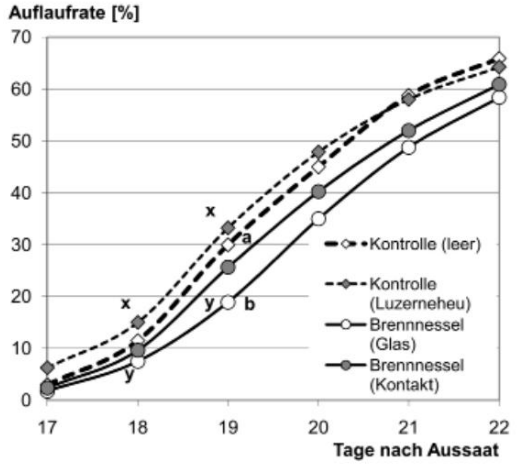

Fig. 4: Delayed emergence: emergence rates of winter wheat (%) in the cold test depending on the use of the nettle preparation, Dottenfelderhof 2005. Dunnett a 0.05, a, b: comparison to the empty control, x, y: comparison to the control with alfalfa hay, different letters differ significantly.

seeds, the difference in emergence rate of relative - 35% to the empty control and of relative - 43% to the control filled with alfalfa was statistically verified (Fig. 4). This result was not confirmed in the brick tests. In contrast, oak bark caused a significant shortening of the mean shoot time in the ZGT-Fh.

Differences between glass and contact preparation:

While the germination rates with contact preparation were consistently slightly lower in all three tests, the seed plant weight, especially the dry matter of the shoots and the shoot:root ratio, were consistently slightly increased compared to the glass preparation. The mean sprouting time was significantly shortened in the average of the germination tests with contact preparation compared to glass preparation, with significant edge reduction in the cold test and in the ZGT-Gs. The shortening of the shoot time was associated with increased emergence rates at the beginning of plant emergence (17th to 21st day after sowing). The mean of all contact preparations on the fourth counting day of the cold test differed by rel. 14% higher processing rate significantly compared to the average of all glass preparations.

Comparison of preparation types for individuals Preparation applications:

• In the variant with 'All preparations', the average of the three growing force tests with contact preparation showed a very small, although significant, shortening of the mean shoot time (1%) compared to glass preparation and a shift in the shoot:root ratio in favor of the sprout (3%).
• When using stinging nettle, contact preparation was carried out in the Across the three tests, a significantly higher dry mass of the shoot was found compared to glass preparation, as well as a shift in the shoot:root ratio in favor of the shoot.
• The decline in root mass when using valerian in the cold test was more pronounced with glass preparation than with contact preparation. The relative difference of 4% between the two valerian variants is statistically proven. There is also a significant difference in terms of the average growing time: with a delay in preparation for glass preparation compared to an acceleration in contact preparation. This was associated with significantly higher emergence rates on the 18th to 21st day after sowing.
• The variant with contact-prepared oak bark preparation differed significantly from the glass-prepared variant in the second brick-crust test (ZGT-Gs) due to a higher shoot and root mass as well as a shorter shoot time, with the differences compared to the controls cannot be statistically verified were.

discussion

As the description of the results shows, the chosen methodology was able to demonstrate the effectiveness of all preparations when used individually. However, the effects on root mass and average shoot time are only statistically verified on average for both preparation variants. However, the fact that these effects occurred in the same direction in both types of preparation and that in over half of the cases the deviation of the glass-prepared variant from the control was slightly greater speaks for the effectiveness of the preparations from the sealed glass tubes . Two phenomena could occur

statistical individual comparison of the glass-prepared variant with the empty control variant: the emergence delay when using nettle in the cold test and the increase in the shoot:root ratio due to valerian application on average in all three tests.

On the other hand, the differences found between the types of preparation, such as the increase in shoot mass found in contact preparation on average in the three tests and the slight increase in the speed of application, indicate an increased driving force effect with direct exposure Contact of the preparations with the substrate. This raises the question of how the effect of the preparations is modified by the moist environment of the immediately adjacent substrate on the one hand, or by the medium of glass and the lack of contact with the substrate on the other. Since the amounts of preparations used were very small (75 to 215 ppm) and were not evenly distributed in the substrate, a quantitative nutrient effect can largely be ruled out.

The reduction in root mass under the influence of preparations raises questions about the type of effect of the preparations and appears to be consistent with the results of other experiments (GOLD-STEIN and KOEPF 1982, BACHINGER 1995) to contradict. In contrast, these confirm this

The results presented include our own results from cold tests with radish seedlings using the yarrow preparation (publication in preparation). To understand this, it should be taken into account that the compost preparations were not designed for the direct treatment of plants, but rather for the treatment of manure. In addition, it is known from previous experiments that the effect of the preparations interacts with the environmental or Experimental conditions are available (SPIESS 2002). In this case, the cold and darkness or Artificial stress conditions were created by layering with brick gravel, against which the plants had to grow their shoots.

Summary and Conclusions

Although the selected test method only revealed relatively weak effects of the compost preparations on the development of wheat seedlings, the results can be viewed as proof of the effectiveness of the preparations. This is contradicted by the fact that in the majority of cases the effects achieved compared to control with substances could not be guaranteed.
The ability to detect the effects of the preparations turned out to depend on the test methodology, in particular the temperature conditions.

Fig. 5
Glass tube filled with biodynamic preparation and cotton plug

The seedling development was slightly slowed overall under the influence of the preparations, thus confirming HAGEL 's findings (1988) does not. Even though the preparations sometimes showed a slightly stronger effect than the glass versions when in direct contact with the substrate, the results suggest a radiation effect of the preparations from sealed glass tubes. In this respect, the results of HAGEL (1988) could be partially confirmed. In order to fully clarify the question of the radiation effect, further series of tests would have to be carried out based on the experience gained.

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