

PG Suspension for the Control of Fomes Root Rot of Pine

INFORMATION NOTE

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SUMMARY

Use of the biological agent PG Suspension to control Fomes root rot of pines is described. Because the agent is a suspension of living spores (of the fungus *Phlebiopsis gigantea*), special care is needed in its storage and handling.



BACKGROUND

1. The biological agent PG Suspension was given full approval for use as a forestry fungicide for the control of Fomes root rot of pine on 2 April 1998. The Forestry Commission is the approval holder. Approval was granted subject to statutory conditions on the manufacture, packaging and use of the material. This Note sets out the conditions for the use of the product in the forest.

LEGISLATION

2. Approval was granted for the advertisement, sale, supply, storage and use of PG Suspension, with MAFF Number 08975, under Regulation 5 of the Control of Pesticides Regulations 1986 (SI 1986/1510). This approval remains subject to review, amendment or revocation in the interests of safety. Importantly, it is a legal requirement that the regulatory authority PSD (Pesticide Safety Directorate) is provided with full reports of any adverse human effects from exposure to the product.
3. Besides legislation relating solely to approval, use of the biological agent PG Suspension is subject to normal health and safety provisions of the Health and Safety at Work Act (HASAWA), and the Control of Substances Hazardous to Health (COSHH) Regulations. The latter require that a risk assessment be carried out and appropriate control measures put in place.

FOMES ROOT ROT

4. The product PG Suspension was developed to control Fomes root rot, a worldwide disease of conifers

caused by the wood-rotting basidiomycete fungus *Heterobasidion annosum*. This pathogen gains entry into stands when airborne spores, which are present throughout the year in Britain, infect freshly-cut conifer stumps. It then spreads across root contacts from the diseased stumps into the roots of healthy trees. On some soils where pines are killed by *H. annosum*, the gradual spread of the disease within a stand can lead to serious losses to an extent where plantation forestry is no longer economic. Because *H. annosum* can only gain entry into healthy plantations through stump surfaces, exercising control of the disease by preventing stump infection is possible. Chemicals applied to stump surfaces at time of felling can be effective, but in pine successful use has been made of a competitor fungus, namely *Phlebiopsis gigantea* (Figure 1). This is the organism used in the biological control agent PG Suspension.



Figure 1. *P. gigantea* fruiting on a pine stump 12 months after treatment with PG Suspension.

PHLEBIOPSIS GIGANTEA

5. *Phlebiopsis gigantea* (Fr.) Jul., previously known as *Peniophora gigantea* (Fr. ex Fr.) Masee, is a wood-rotting fungus capable of colonising pine stumps. Like *H. annosum*, it is widely distributed throughout the conifer forests of the northern hemisphere and is native in the UK. It plays an important role in the decay and breakdown of moribund and dead wood, and in fresh pine stumps it competes directly with *H. annosum* for the wood resource. *P. gigantea* is perhaps the more rapid coloniser of the two, especially when it is the first to arrive on the substrate, as is the case when it is applied in stump treatment. It is incapable of causing disease in standing trees and is not regarded as hazardous to human health.

PG SUSPENSION

6. The product PG Suspension is formulated from laboratory-grown spores of *Phlebiopsis gigantea*. These are harvested and suspended in a preservative sucrose medium that maintains viability and discourages germination while preventing the growth of other microorganisms. The concentrated suspension is packaged into hermetically-sealed PVC sachets, each containing 7–10 ml of suspension and around 20 million live spores. The product is mixed with water (one sachet to 25 litres) to make a working-strength solution, which is applied to stumps manually or by harvester, at an approximate rate of one million spores to each square metre. The natural rate of deposition of *H. annosum* spores rarely exceeds 20 000 spores per square metre per hour, and application of the biocontrol agent gives *P. gigantea* a significant advantage in the race to colonise stump wood.



Figure 2. In culture, the hyphae of *P. gigantea* break up into these oidial spores, which are used in the manufacture of PG Suspension.

HANDLING, MIXING & USING

7. Instructions on the safe handling of the product are clearly displayed on the product label and leaflet. Those that appear as statutory conditions are legal requirements and must be complied with.
8. Spores will not remain viable in the sucrose medium indefinitely, and if stored at 4°C each batch of the product has a shelf life of 7 months from the time of manufacture. The expiry date is clearly displayed on the label. Batches are checked by Forest Research before they are released for sale. A batch is passed if it contains between 3.5 million and 10 million live spores per ml, and has fewer than a specified number of other microbes. Further checks are made during the lifetime of the batch, to ensure continued viability. Sachets remaining unused at the end of their shelf life must be destroyed by autoclaving or pressure-cooking.
9. The suspension will die if exposed to high temperatures for even a short time. Sachets stored in the forest must be kept cool at all times and never exposed to damaging temperatures (such as might occur in closed vehicles). When released from the sachet and mixed with water, spores germinate, and their shelf-life is reduced to less than 24 hours. It follows that a fresh working-strength solution is required each day. The solutions should be made with fresh water in clean containers free from residues of old solutions. This precaution is needed to reduce the build up of bacteria that both interfere with the viability of the product and, in extreme circumstances, might create a health hazard. Solutions unused at the end of each day should be discarded by pouring on to soil, and the containers rinsed out and allowed to drain overnight. The spores have the same density as water, and will not normally settle out during the day. However, to ensure an even distribution over stump surfaces, it is necessary to get spores thoroughly dispersed by vigorous shaking when making up the working solution each morning.
10. The product should be applied as soon after felling as is practicable and certainly within 30 minutes. Immediate treatment improves the competitive ability of *P. gigantea*, and avoids the disadvantages that follow from treating stumps the surfaces of which have become resinous. Complete coverage is needed to provide adequate levels of control. Dyes that are compatible with the living product which do not

Figure 3. PG Suspension as packaged in 10 ml sachets.



present a hazard to operators or the environment can be mixed into the working suspension. These can be selected to provide either long or short-term evidence of treatment, while acting as a guide to the extent of coverage. Completing a COSHH assessment for the process of mixing and applying the dyes before they are used for the first time will be necessary. Advice on the selection of dyes can be obtained from Forest Research.

11. Application of PG Suspension by harvesters should not be undertaken until it can be shown, by test, that the particular machine will not compromise the quality of treatment by, for example, exposing the spores to lethal temperatures or excessively high pressures. Such tests can be arranged by Forest Research and should be conducted with the machine fitted with the application system that will be used. Empirical trials are needed because there are insufficient data on the effects of different stump treatment application systems (e.g. spray bar or nozzle) on the viability of PG Suspension.
12. Unfortunately, the effects of treatment are not readily observable. However, samples may be removed from treated stumps and assayed by staff who are trained to identify the characteristic growth of *P. gigantea* and *H. annosum*. Similar techniques can be employed to check the viability of working solutions taken from the point of delivery from a harvester. More complex investigations requiring, for example, the growth of the control agent on nutrient agar can only be undertaken in specialist laboratories.

AREAS OF USE & APPLICATION RATES

13. The product PG Suspension is limited for use only as a forestry fungicide on pine stumps. The regulations specify that no more than 10 sachets per hectare can be applied during a single thinning or felling, and that no more than one treatment per stump is permitted. The product is supplied in sachets fixed to a cardboard folder, and should remain attached until used. The folders contain statutory information relating to the safe use of the product which must be drawn to the attention of operators.

SUPPLIERS

14. The product is manufactured by Omex Environmental Ltd. All orders should be sent to:

Omex Agriculture Ltd.
Bardney Airfield
TUPHOLME
Lincolnshire
LN3 5TP

Tel: 01526 398 661
Fax: 01526 398 434

ENVIRONMENTAL IMPACT

15. The use of PG Suspension in Forestry Commission plantations for more than 30 years has not resulted in any observed environmental problems. Theoretically, butt logs splashed with PG Suspension could be degraded by fungal stain and decay if left in the forest for several weeks after cutting. In practice, this has not been a significant problem. No damage to plants was evident in a recent Swedish environmental trial of an analogous product.

ADVICE

16. Advice on all aspects of the use of PG Suspension can be obtained from the Pathology Branch of Forest Research at either of its two laboratories.

Enquiries relating to this publication should be addressed to:

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