Seed dressing of Seed with Fungicide and Insecticide

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Summary

Attacks of common bean by fungal diseases such as anthracnose, damping off or root rots, and insect pests like stem maggots are responsible for large yield losses in Africa. Control measures against these pathogens have to be taken early on in the season for avoiding damage of common bean crops. The small gains in common bean yields across Eastern and Southern Africa that were made over the past 30 years despite an increase of the cultivated area is in large part attributed to diseases and insects. Such infestations also pose major risk to the profitability of improved varieties and fertilizer inputs by farmers. Dressing seed of common bean with chemical control agents for diseases and pests offers a cheap and environmentally friendly technology to prevent losses and enhance production. The seed treatment approach uses minimal amounts of pesticides and results in better seedling emergence that in turn strengthens the resistance of crop stands throughout the growing season.

Technical Description

Common bean diseases such as anthracnose, bacterial blight and angular leaf spot, and insect pests such as bruchids are harbored by seed, and lead to destruction of planting material stocks and potentially affect large areas of farmland. On the other hand, soil-borne diseases like wilts, rots and rusts, and insect pests like bean stem maggots plague seedlings of common bean which can lead to sparse plant density or even total crop failure. The technique of seed dressing makes it possible to keep common beans free of these diseases and pests during seed storage and seedling emergence. Use of seed dressing achieves a very high degree and efficiency of crop protection since it guarantees uniform application of control agents and delivers these where they are needed most. In this way the method minimizes undesired effects on non-target organisms in soils and spillage of chemicals into water bodies such as is the case for broadcast spraying of crop stands. The advantage of seed dressing is that it doesn’t require specialized equipment and can be easily performed at farms and factories, making it a solution that can be widely adopted.

Uses

Seed dressing technology for fungicides and insecticides is strongly recommended in all major production areas of common bean due to the high prevalence of diseases and

pests. Seed dressing products such as Syngenta’s APRON STAR® contain a fungicide and insecticide mixture for controlling fungal diseases (e.g. Pythium and Fusarium) and early season insects pests (e.g. stem maggots, termites, thrips and whiteflies) including ones that serve as disease vectors. As a result, root development is stimulated leading to vigorous starts, uniform growth and higher yields. Benefits continue for about three weeks after planting. The approach is very suitable for tropical regions with cool and humid climates that favor the proliferation of fungal pathogens. Control agents for a large number of pathogens can be coated onto seed in ways adjusted to which soil type and pest and disease conditions. Fungicide and insecticide seed treatment lies at the foundation of precision agriculture and integrated pest management, contributing largely towards sustainable intensification and strengthening resilience of common bean.

Composition

Control agents for seed dressing are sold in both liquid and dry formulations. Combinations of different chemical substances can be used for seed treatment based on guidelines provided by the suppliers and should not be confused with products intended to protect bans during storage as food. The most common broad-spectrum fungicides for seed dressing are tetramethylthiram disulfide and N-trichloromethyl-thio-4-cyclohexene-1, 2-dicarboximide, which have low toxicity. Some systemic fungicides, such as metalaxyl, offer protection against fungal diseases up to maturity of the plant. Insecticides against bean stem maggot and thrips used for seed dressing include N-methylcarbamate, imidacloprid and thiamethoxam. “Do it yourself” seed treatment products containing both fungicides and insecticides are also available. Farmers producing their own bean seed may also take advantage of this technology by purchasing inexpensive packets of seed dressing pesticides. It is important that seed dressing products be colored in a way that they are identifiable and accompanied by warning messages so that treated seeds are not consumed.

Means of application

Bean seeds have to be weighed for ascertaining the dosage of chemicals that is required. Liquid formulas may be directly coated or after dilution, whereas dry formulas contain adhesives and are added directly to seeds. Seed dressings can be carried out manually using common receptacles or mechanically in mixers and hoppers. Treating smaller volumes of seed can be done inside a plastic bucket or basin, or by spraying seed with the solution on top of a polythene sheet. For dressing large volumes, community-based and commercial seed producers can make use of a rotary drum that is powered by hand or motor. Common beans that are treated with control agents are planted following recommended land preparation, spacing and fertilizer inputs in a particular growing area. Les agriculteurs qui produisent leurs propres semences de haricots peuvent également tirer parti de cette technologie en achetant des sachets bon marché de pesticides pour l'enrobage des semences. Il est important que les produits d'enrobage des semences soient colorés de manière à être identifiables et accompagnés de messages d'avertissement afin que les semences traitées ne soient pas consommées comme des aliments.

Agroecologies	Highlands, Humid forest, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Zimbabwe, Zambia, Uganda, Tanzania, South Sudan, Rwanda, Nigeria, Mozambique, Malawi, Kenya, Ethiopia, Democratic Republic of the Congo, Cameroon, Burundi.
Available in	Zimbabwe, Zambia, Uganda, Tanzania, South Sudan, Rwanda, Nigeria, Mozambique, Malawi, Kenya, Ethiopia, Democratic Republic of the Congo, Cameroon, Burundi.
Solution Forms	Input Supply.
Solution Applications	Insect control, Disease control.
Agricultural Commodities	Common bean.
Target Beneficiaries	Small-scale farmers, Commercial farmers, Agro-dealers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

Accelerated deployment of this innovation can be realized across common bean growing areas through these actions: 1) Identifying and developing effective pesticides for seed treatment to control diseases and insect pests, 2) Raising awareness with farmers about the benefits and availability of seed dressing pesticides, 3) Providing access to seed treatment for community-based and commercial seed multipliers, and by agrodealers and 4) Linking producers to financial support and markets. Bean seeds marketed by commercial seed companies are almost always treated, but seed bought as grain and used for planting are not. Creating further demand for these seed coating products is an important step in the commercialization.

Production Costs

Fungicides and pesticides for seed dressing have variable retail prices depending on its level of concentration and efficacy. At prescribed dosages the chemicals alone cost US

$0.5 to $1 for treating one or two kilograms of seed. Manual application makes use of equipment that can be purchased for less than US $50, whereas rotary drums for mechanized application are sold at US $500 for a small unit and US $2,000 for a large unit. Training is important because treating seed requires knowledge and skills to be performed properly and safely.

Customer Segmentation

Seed dressing with chemical agents to control seed and soil borne pests in common bean production is attractive for small-scale and commercial farmers, and opens a new product line for community-based multipliers and local agro-input dealers.

Potential Profitability

Delivering fungicides and insecticide through seed dressing has several advantages over broadcast spraying as it enhances the precision and effectiveness of crop protection while reducing the required dosage and associated costs per land area. Studies in major production zones with diverse soils and climate have shown that seed dressing leads to greater numbers and evenness of plant stands. Treatment of seed with pesticide reduces common bean yield losses up to 70%.

Licensing Requirements

Agrochemical companies and agrodealers may require a phytosanitory and product safety license to distribute seed dressing pesticides in compliance with regulations from national regulatory bodies specific to the different countries.

Innovation as Public Good

Intellectual property about the composition of fungicides and insecticides for seed dressing of common bean is commercially owned. The know-how of coating bean seeds with fungicides is being disseminated as a Public Good by ABC's PABRA program.

Solution Images



Example of common bean seed treatments with fungicide and insecticide



Fungal wilting of seedling (left) and damage to bean sprout by stem maggots (right)

Institutions

