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Introduction and Prevention and Control of Mulch Film Residual Pollution

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Abstract

The mulch film is one of the important material production materials in China's agricultural production, and the large-scale use of the mulch film also causes "white pollution" to a certain extent. The residual film will also cause pollution and damage to soil and crops. Degradable mulch film is an effective means to solve the residual pollution of the film. In this paper, the basic conditions, application characteristics and shortcomings of biodegradable mulch film are reviewed. In general, with the advancement of technology and changes in the agricultural production environment, biodegradable mulch applications will have good prospects.

Keywords

Mulch residual pollution; Biodegradable mulch; Application and development.

1. Introduction

Plastic film is one of the important material production materials in my country's agricultural production. Its wide application has promoted the change of agricultural production methods and improved agricultural productivity. In the past 30 years, the amount of plastic film and the area of crops have been increasing steadily. The application of plastic film has guaranteed my country's agricultural product safety supply has made a significant contribution. At the same time, the widespread application of mulch film has brought about a series of problems, such as widespread use and abuse of technology, and "white pollution" caused by mulch film residues. Therefore, the rational use of mulching film technology and the development of new environmentally friendly biodegradable mulching film products have become a new demand for modern agriculture in my country [1-2].

2. Application of Mulching Film and Characteristics of Residual Pollution

2.1. The Impact of Mulching Technology on Agriculture

With the development of agricultural technology, Japanese scientists invented the mulching technology in the 1950s. In the early days of the invention, the main objects of mulching were cash crops, especially horticultural crops. In the late 1970s, China introduced mulching film technology. With the advancement of plastics industry technology, especially the research and development of mulching film materials, the advancement and improvement of film blowing technology, the wide application of mulching machinery, the continuous improvement of mulching products and methods, Making the mulching film technology quickly popularized and

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applied. The annual investment of mulching film has gradually increased from 1.5 million tons to 2 million tons. The mulching film can increase the moisture and heat preservation of crops, increase the output of crops, provide technical support for the realization of off-season vegetables, and make a huge contribution to the development of agriculture in my country. Contribution.

The main application of mulching film is embodied in the following aspects: 1) Change the crop sowing date and expand the crop planting area [3]; 2) Inhibit weeds and weeds, inhibit salt and protect seedlings [4]; 3) Significantly increase soil temperature and prevent soil Water evaporation [5]; 4) Change the regional planting structure to form a new planting model; 5) Increase crop yields and ensure national food security [6]. With the development of film-making technology, mulch film is more and more widely used in agricultural production. The application area and application intensity are increasing year by year. At the same time, the types of film-covered crops are also increasing year by year. The environmental pollution caused by the use of mulch is gradually emerging.

2.2. Pollution and Harm Caused By Mulch Residue

The residue of mulch film is also a kind of "white pollution", which will cause damage and harm to the soil and the environment, and different regions will have differences due to the amount of use, time of use, and types of crops covered. In general, the residual plastic film will cause the following effects: 1) The increase in the amount of residual plastic film in the soil will reduce soil permeability and soil porosity, and reduce fertility [7]; 2) residual plastic film in the soil This hinders the migration of water and nutrients in the soil, and in severe cases, it will increase with the increase of the residual film amount. At the same time, the residual film is easily reunited in the soil, causing capillary breakage and blocking the rise of capillary water [8]; 3) Affect the growth and development of crops and reduce the yield of crops. The residual mulch film affects the soil structure, water transport and crop growth and development, and then affects the yield of crops, especially for fibrous root crops [9]. 4) Other adverse effects of residual mulch film. Residual mulch film will also bring a series of other negative effects on agricultural production and the agricultural environment. For example, farmers will burn the recycled residual film in the ground, and the harmful gas generated by burning the residual film will pollute the atmosphere. Residual film fragments mixed with crop straw and grass, cattle, sheep and other livestock can cause gastrointestinal dysfunction, decreased body condition, and cause anorexia and eating difficulties in severe cases, resulting in death [10]. The residual mulch in the soil will affect the farmland mechanical farming, and the residual film is easy to wrap around the opener when sowing, resulting in a decline in the quality of sowing.

3. Introduction and Application of Biodegradable Mulch

3.1. Overview of Biodegradable Mulch

Biodegradable plastic film refers to the film produced by plastic that can be degraded by the action of microorganisms in the natural environment [2]. The Japan Biodegradable Plastics Research Technical Committee defines it as "polymers and their blends that can be decomposed into low-molecular compounds that will not have a bad impact on the environment through the action of microorganisms in nature" [11]. Using biodegradable film instead of traditional polyethylene (PE) film can greatly reduce the environmental pollution caused by traditional PE film. Biodegradable mulching films can be divided into degradable mulching films using natural biomass as raw materials and degradable mulching films using petroleum-based materials as raw materials. The natural biomass such as starch, cellulose, chitin, etc. used in the degradable mulch film using natural biomass as the raw material is modified and re-synthesized to form

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the production raw material of the biodegradable mulch film. Especially starch application has carried out a lot of work in the production of biodegradable mulch film. The mulch film with starch as the main raw material can be divided into starch-added incomplete biodegradable mulch film and fully biodegradable mulch film with starch as the main raw material according to the degradation mechanism and destruction form [12-13]. The fully biodegradable mulch film produced from starch is mainly produced through fermentation to produce lactic acid. The lactic acid is re-synthesized to form polylactic acid (PLA), and the mulch film produced with polylactic acid as the main raw material. Another important type of natural biomass degradable mulch is a mulch made of cellulose, which can be completely degraded through etherification, esterification and oxidation of cellulose into acids, aldehydes and ketones [14]. The production of degradable mulch film with petroleum-based raw materials mainly includes dibasic acid glycol copolyester (PBS, PBAT, etc.), polyhydroxyalkanoate (PHA), polycaprolactone (PCL), and polyhydroxybutyrate (PHB), CO2 copolymer-polypropylene carbonate (PPC), etc. These high-molecular substances can be quickly decomposed and utilized by microorganisms in nature, and the final degradation products are carbon dioxide and water [15-16].

3.2. Characteristics and Application Of Biodegradable Mulch

With the production and application of biodegradable mulch film, through the modification of raw materials and the improvement of formula, the technology of degradable mulch film is becoming more and more perfect, and it is gradually used in agricultural production, and the use rate of traditional PE film is gradually decreasing. Through actual experiments, biodegradable mulch film is compared with ordinary PE film: 1) There is no big difference between biodegradable mulch film and ordinary mulch film in terms of heat preservation and increase in output; 2) The use of biodegradable mulch film basically does not cause too much film residue ; 3) It is of positive significance to the environmental protection of agriculture in our country; 4) The biodegradable mulch is mainly used in horticulture and vegetable production. At the same time, through the research and improvement of the biodegradable biofilm, the material formula can be used to prepare other biodegradable products, and the fine formula can be used to prepare industrial-grade polymer materials, which can be added to the plastic products in daily life. , Such as the products made today: PLA wet wipes; PLA staple fiber; 3D printing consumables; biodegradable shopping bags; pen covers; plastic products shells and other products. In the process of preparing mulch film, the research topic can be enlarged to degradable plastics, so that not only mulch film products, but also can play a great role in the treatment of "white pollution".

4. Problems, Challenges and Development of Biodegradable Mulch Film

Biodegradable mulch film has gradually been widely used in agricultural production due to its good biodegradability and low environmental pollution. Biodegradable mulch film also has certain shortcomings: 1) The tensile strength of the product needs to be further improved to improve biodegradation. The mechanical strength of the mulching film can better carry out large-scale operations; 2) The degradation controllability is different from the needs of crops, which requires adjusting measures to local conditions and increasing the types of mulching films to make the coverage period of the mulching film more consistent with the crop growth cycle; 3) The performance of increasing temperature and keeping moisture needs to be further strengthened. Moisture enhancement and heat preservation are the main role played during the use of mulch. Biodegradable mulch has a certain difference in heat preservation effect and PE mulch during the experiment, while biodegradable mulch is obviously inferior to PE mulch in terms of water retention. PE mulch film; 4) Reduce product cost and promote large-scale application. The high cost of biodegradable mulch film is another limiting factor for the large-

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scale promotion and application of current products. As the technology matures and improves, the cost of biodegradable mulch film is also Is gradually decreasing. At this stage, it is necessary to improve agronomic technology to make it suitable for the performance of biodegradable mulch products and meet the needs of agricultural production. Plastic film coverage is very important and indispensable to food security. The market potential of plastic film products is huge, but the problem of residual pollution of plastic film will become more and more serious. If it is not solved, it will cause environmental disasters in local areas. At this stage, it is necessary not only to carry out the treatment of the polluted farmland, but also to strengthen the monitoring of the light and non-polluted areas with high intensity of mulching film application, and do a good job in prevention. Biodegradable mulch is an important way to solve the problem of residual pollution of mulch. It has excellent effects in agricultural production and has great potential, but there are many technical problems. At present, it is necessary to strengthen the research on the raw materials, formulas and production processes of biodegradable mulch, improve product quality and reduce product costs, especially to develop regional and crop-specific biodegradable mulch products to meet and adapt to the requirements of agricultural production diversity, And at the same time apply it to a wider range of biodegradable plastics.

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