Study on Environmental Effects of Different Covering Measures on Spring Maize Planting in the Loess Plateau

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Abstract. Covering farming techniques is an effective means of protecting and managing soils in arid, semi-arid and sub-humid and drought-prone areas, and is a change to traditional farming systems. This technology can regulate the "water, fertilizer, gas, heat" of farmland soil, change the physical and chemical properties and environmental quality of soil in arid areas, and effectively solve a series of problems caused by drought and irrational farming. Through different farming cover measures, in order to achieve stable production and high yield, it has important promotion value in the loess area. Through comprehensive research on the relevant research and demonstration experience of predecessors, this paper deeply studies the growth and development of spring maize and soil water and fertilizer effects under different cropping practices. It is found that different coverage measures have significant gain effects on soil moisture and fertility. The increase in corn production has a positive effect.

1. Introduction
The Loess Plateau is the birthplace of the Chinese nation's agriculture. It has a long history of agricultural farming culture and is the most important dry farming area in China, but it has become one of the most severely soil erosion areas in the world. It is well known that the lack of rainfall in the hills of the Loess Plateau, the fragmentation of the gully area and the inappropriate agricultural practices have led to serious soil erosion in the area, deterioration of the ecological environment, continuous decline of soil fertility, low and unstable crop yields, and annual production costs. Increase [1]. The emergence of this series of problems has made controlling soil erosion and maintaining ecosystem balance a special concern for human survival and development and environmental issues. Covering farming techniques is an effective means of protecting and managing soils in arid, semi-arid and sub-humid and drought-prone areas, and is a change to traditional farming systems. This technology can regulate the "water, fertilizer, gas, heat" of farmland soil, change the physical and chemical properties and environmental quality of soil in arid areas, and achieve the means of stable yield and high yield through different
farming cover measures [2]. Therefore, the implementation of this technology in the dryland of the Loess Plateau is crucial to the sustainable development of agriculture in the region.

Drought and little rain are typical climatic characteristics of the Loess Plateau and a major factor limiting the sustainable development of agriculture. Severe water shortages and poor soil fertility lead to unstable crop yields and fertilizer losses [1]. At the same time, the soil and water loss in the loess area caused by unreasonable land use and farming methods eroded the cultivated land, causing the gully to be vertical and horizontal, fragmented and fragmented, which aggravated the situation of “dry, thin, rough and poor” [3]. Covering farming techniques as a high-yield, high-efficiency, low-cost, environmentally-friendly agricultural farming measure can effectively solve a series of problems caused by drought and irrational farming, and has important promotion value in the loess area.

In summary, it is of great significance to carry out cover farming techniques for the sustainable development of dryland agriculture on the Loess Plateau, to maintain the balance of farmland ecosystems, and to improve the living standards of the people. Through comprehensive research on the relevant research and demonstration experience of predecessors, this paper deeply studies the growth and development of spring maize and soil water and fertilizer effects under different cropping practices, in order to provide a theoretical basis for water and fertilizer regulation and efficient use of water resources in this area [4].

2. Effects of tillage and cover measures on soil environment of spring maize

2.1. Effects of different tillage cover measures on soil moisture

Agriculture in dry farming areas is not irrigated, and crop water is mainly from natural rainfall. Therefore, how to effectively use natural water resources to maximize its production increase has always been a key issue facing dryland agriculture [5]. Covering farming techniques use less moving soil, cover to reduce soil erosion by rain, avoid crusts, reduce runoff, promote rainwater infiltration efficiency, and improve crop water use efficiency. After no-tillage, the soil has good physical and chemical properties, and has the effect of inhibiting evaporation and good water retention. At present, the role of farming techniques in increasing soil water storage and reducing surface runoff has been basically affirmed, but there are also different opinions.

Straw mulching increases the protective layer of the soil surface, and the water returns to the soil during the rising process, and the straw mulching can reduce the evaporation of water due to the wind, so the soil moisture is significantly improved. At the same time, it blocks the sun's exposure to the soil, lowers the soil temperature, and reduces the soil water activity [6]. The mulching film is characterized by water retention, water collection and regulation of moisture. The mulch isolates the soil from the external environment. The process of evaporation of soil moisture by the sun is blocked by the mulch. The direction of water movement changes and finally returns to the surface layer of the soil for crop utilization. As a result, the total evaporation of soil moisture is reduced, ensuring sufficient ploughing. Water content [7, 8].

Hu Fen [9] in Shangqiu, Henan Province, showed that the water content of 0-30 cm soil layer increased by 58.8% under the condition of straw mulching, and the surface layer increased by 25% from 0-5 cm. Zou Cong et al [10] showed that straw mulching and plastic film mulching measures can significantly increase soil water storage, especially in high temperature and drought in July, compared with traditional farming, 0-60 cm soil water storage increased by 3.40%. And 6.64%. Fan Xiangyang [11] research on the coverage of spring maize showed that there was no significant difference in the regularity of water consumption during the growth period of spring maize between covered and uncovered, but the mulch and straw mulching were hindered by the evaporation of water in the soil. The water that is good for crop growth increases, and the total water consumption decreases. The results of Li Lingling et al [12] in the western part of the Loess Plateau showed that the no-tillage straw mulching can significantly increase the surface soil water content during the planting period, but had little effect on the water content of the section, but there was a significant difference in crop water consumption. Other studies suggest that no-tillage does not always increase soil water content in the case of short-
term trials. On the contrary, in sandy soils, the water content of tillage is higher than that of no-tillage [13]. Some studies have also found that the soil water content of the mulch covered surface is significantly different from that of the uncovered soil, but with the increase of the depth, the difference between the water content of the uncovered and the covered soil is not significant, and the water content of the covered soil is significantly reduced [14]. The experimental results of Wang Jun et al [15] also showed that the effect of plastic film mulching on the soil was not obvious after 40 days of sowing. Therefore, when the mulching film is planted in the arid area, it is necessary to control the period of film mulching according to the actual water temperature of the soil, so as to prevent excessive water consumption in the early stage of crop growth and insufficient water supply in the later stage.

2.2. Effects of different tillage cover measures on soil fertility

The organic matter and nutrients in the soil are more abundant in the soil covered by straw, and the straw is rotted. After fermentation, it can provide more nutrients for the soil to be absorbed and utilized by the crops. Studies have shown that the straw of wheat can be decomposed by microbial fermentation. The soil provides a variety of nutrients such as organic matter, NO, P2O5 and many trace elements [16]. At home and abroad, there have been a lot of studies on the effects of less no-tillage on soil fertility, and most of the studies on soil nitrogen, phosphorus, potassium and organic matter. Many studies have shown that straw mulching is conducive to the increase of soil organic matter and nutrient content, and the surface difference is significant.

The soil disturbance is reduced by less no-tillage treatment, the amount of organisms and microorganisms in the soil is increased to a certain extent, and the better living environment makes the microorganisms more active in the soil, and the straw, residue and other substances in the soil are absorbed by the microorganisms. The use of some series of physiological and biochemical effects to release nutrients for direct use by plants, and another part can be through the assimilation of metabolism to make nutrients into life structures, microorganisms can not only convert nutrients in the soil that cannot be directly absorbed by plants into Quick-acting nutrients, but also the nutrients in the soil can be converted in the microbes, reducing the loss of essential nutrients. After long-term accumulation, the nutrients in the soil are more and more abundant, and the enrichment degree is increased, which provides good growth for crops. Surroundings. Liu Shiping [17] studied the no-tillage straw mulching, no-tillage sorghum, and ploughing straw returning to the field through the three-year positioning experiment of the Datian Community and the net room cement pool micro-region. The effects of four treatments on physicochemical properties and rice and wheat yields in the mulched wheat crops and ploughing (control) showed that soil organic matter, total nitrogen, available phosphorus and available potassium were more than three years after tillage Increase by 4.7%-13.0%, 0%-10.6%, 0.2%-10.6%, 8.4%-15.5%. Tian Hui et al [18] believe that no-tillage increases the number of microorganisms and animals in the soil, especially the number and activity of alfalfa. The flipping of alfalfa in the soil can improve the soil structure, and its residue can increase the soil organic matter content. The results of Luo Zhuzhu [19] show that straw returning can significantly increase soil organic matter, total nitrogen, total phosphorus, total potassium, ammonium nitrogen, available phosphorus, available potassium and hydrolase activity in 0-10 cm soil surface. No-till reduced the nitrate nitrogen content in 0-5 cm, 5-10 cm, and 10-30 cm soil layers, but significantly promoted catalase activity. The content of organic matter, available nitrogen, phosphorus and potassium in the 0-10 cm layer of soil showed a significant regression relationship with the coverage of straw [20]. The results of Yuan Jiafu [16] show that the straw covered by farmland can be decomposed and enter the soil under the joint action of rainwater and soil microorganisms, which can effectively increase the content of soil nitrogen, phosphorus, especially soluble potassium, and promote soil organic matter. Formation.

3. Effects of different tillage practices on crop yield and water use efficiency

The mulch and straw cover increase the ground temperature, reduce the evaporation of soil moisture, increase the activity and quantity of microorganisms, and create a good ecological environment for the stable production of crops, thus achieving high yield and good quality [21]. The mulching film inhibits soil water evaporation, increases soil temperature, and enhances soil microbial activity, thus promoting
crop growth and development. Straw mulching meets the nutrient elements required for crop growth and development by supplying sufficient organic and inorganic nutrients in the soil to achieve the purpose of increasing yield [22]. The root system enhances the ability to absorb water and nutrients in the case of coverage, while growing vigorously under uncovered conditions [23]. Studies have shown that nitrogen use efficiency and water use efficiency of maize increased by 9.8% and 49.15%, respectively ([24]). Some corn mulching experiments show that corn growth traits such as plant height, number of leaves, mulch film coverage, Stem thick, root length, and adsorption area have been improved [21]. Studies have shown that straw mulching can regulate soil water supply capacity, adapt it to crop water consumption rules, ensure water supply during critical periods of crop water demand, and alleviate water supply and demand contradictions, improve crop yields [25]. Hou Liantao and other believe that film mulching can significantly increase winter wheat yield mainly because the cover is conducive to promoting the full utilization of soil moisture by winter wheat, while straw mulching can inhibit evaporation and increase wheat the photosynthesis rate in the late growth stage increased the yield of wheat [26]. Dai et al [27] conducted experiments on nitrogen and phosphorus fertilizers under no-tillage, less tillage and traditional tillage in the Shouyang Dry Farming Experimental Station in Shanxi Province from 2003 to 2008. The results of 6a showed that the average yield and water use efficiency of maize under low tillage mode increased by 9.9% and 9.7% compared with traditional tillage, and the average yield of maize under no-tillage mode and The water use efficiency was the highest, and the soil water retention effect was the best under no-tillage mode, especially in the drought year. Zhao Xiaorong et al studied the yield of rapeseed in Chengdu Plain, and the results showed that no-tillage cover treatment was not covered by tillage. The treatment yield is 6.5%-18.8%.

4. Conclusion

Through comprehensive research on the relevant research and demonstration experience of predecessors, this paper deeply studies the growth and development of spring maize and soil water and fertilizer effects under different cropping practices. It is found that different coverage measures have significant gain effects on soil moisture and fertility. The increase in corn production has a positive effect. In the future, based on previous studies, we will conduct in-depth experiments to study the relevant mechanisms and theories of different tillage cover measures on spring maize yield and soil fertility enhancement, and provide data for high yield and efficient use of crops in the Loess Plateau. Support and reference.

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