

Research on Application of Coal Fly Ash Soil Ameliorant with in Modern Chinese Planting Environment

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Abstract: This paper proposes the academic view of using low ash and less toxic coal fly ash as the soil trace element supplementary ameliorant, which is based on the analysis of circulation rules and loss of soil trace element in modern Chinese planting environment and the unsustainable phenomenon of soil trace element caused by modern planting modes. The comparing field plot experiment has been conducted in Longkou with the selection of burnt Datong coal fly ashes discharged from the power plant of Shengli Oil Field. The result has demonstrated that ashes discharged from coal with low ash and less toxic substance can be used vastly as soil trace element ameliorant, and it can maintain better soil ameliorant and increase the yields of crops.

Key words: Coal fly ash, Soil ameliorant, Planting environment, Trace element, thermal power plant

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The annual let of coal fly ashes amounts to 1.6 billion tons, occupies 33 000 hm² (500 000 mu) of land, accumulates to 11 billion tons within years and causes serious pollution to the environment^[1]. However, the loss of trace element cycles in Chinese modern planting environment^[2]. There are a lot of reports on the applications of coal fly ash in cultivation and farming at home and abroad, and the study of which mainly focuses on the improvement of the soil condition and the increase of output^[3]. Not only have useful elements like K, P, Ca, Mg, Si, Fe, Zn, Cu, B, Mn, Mo, but also harmful ones, which differ in contents. Since the coal fly ash is a complicated mixture and the burning styles of it are different from each other because of the different origins^[4], besides, the effects are different in utilizing coal fly ash in different soil environments. Thus, it is a question which warrants careful consideration to study the feasibility of utilizing the coal fly ash ameliorant as the safe and inexpensive supplied resources of soil trace elements.

1 Material and methods

The soil ameliorant is made by the mixture of coal fly ash from thermal power station of Shengli Oil Field in China, 1.75‰ diammonium and 1.25‰ moisture maintenance material.

The locus of testing planting farmland is in Donglai Town in Longkou City, China. And the soil texture is light soil. The type is brown soil.

The breed of testing corn is Denghai 6213, the density of seedling is 60 000 per hm² (row spacing 0.667 m, seedling spacing 0.25 m).

With the length 7 m and width 5 m, every testing area is divided into five types: (I) empty comparison area; (II) fertilizing area; (III) the area with a half amount of soil ameliorant; (IV) the area with a normal amount of soil ameliorant and (V) the one with great amount of soil ameliorant. Every type is repeated three times, put in order at random with segregating area of 1.5 m between every two areas. The quantity of soil ameliorant and fertilizer was used as in Table 1.

2 Results and discussion

The investigation result of the condition of the corn growth is in Fig 1. The leave acreage coefficient of corn increases with that of the use quantity of soil ameliorant, especially obvious in the later period. This phenomenon does good to the saturation of seeds and production increase.

Table 1 The quantity of soil ameliorant and fertilizer used

Item	Ameliorant		Carbonide		Diammonium	
	kg/hm ²	kg/Area	kg/hm ²	kg/Area	kg/hm ²	kg/Area
I	-	-	-	-	-	-
II	-	-	675	2.25	105	0.35
III	36000	120	675	2.25	-	-
IV	60000	200	675	2.25	-	-
V	84000	280	675	2.25	-	-

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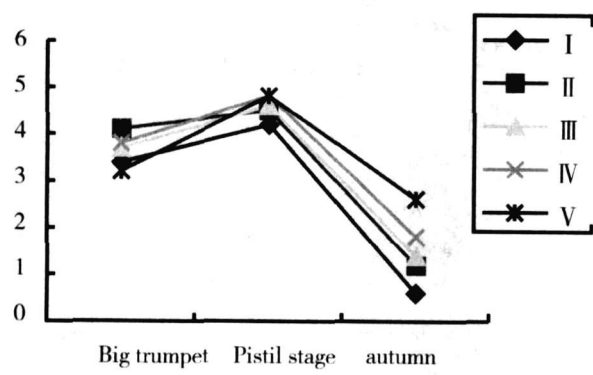


Fig 1 The leave acreage coefficient is in growth stage of corn

The output of com and biological output of plantings that increase is shown in Fig 2. We can find the output increase with the quantity use of soil ameliorant.

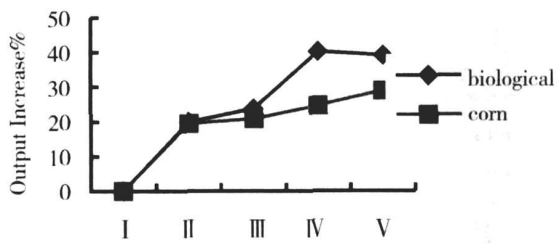


Fig 2 Output increase of corn & Biological Plantings (%)

The production can be increase 20% with fertilizer only. 21 ~ 29 with both fertilizer and soil ameliorant. Soil ameliorant can increase production by 1.9 on the basis of the use of fertilizer. Soil ameliorant with normal amount increases production by 25%, which is

over 5% than the use of only fertilizer. The biological output of plantings increases 24% ~ 40% with the quantity use of soil ameliorant, and the production increase is the highest under the condition of normal amount.

4 Conclusions

The study results show that the soil ameliorant made by the coal fly ash discharged from the thermal power station of Shengli Oil Field has a favorable function in accommodating and promoting planting growth. Under the condition of 60 000 kg plantings per ha, it can increase the com output by 25%, and increase the biological output of plantings by 40%. Therefore, the result has demonstrated that ashes discharged from coal with low ash and less toxic substance can be used vastly as soil trace element ameliorant. It can not only solve the problem of recycling of coal fly ashes in thermal power plants, but also maintain better soil ameliorant and increase the yields of crops.

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粉煤灰土壤改良剂在现代种植环境中的应用研究

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摘 要：在研究分析中国现代种植环境中土壤微量元素循环的规律和缺乏现象的基础上，针对其不可持续性提出了选用低灰和低有害物质的粉煤灰作为土壤微量元素补充改良剂使用的理论观点，并通过选择用以大同煤为燃料的胜利油田发电厂排出的粉煤灰为研究对象，在龙口地区进行了大田种植玉米的试验研究。研究结果表明某些低灰的且有害元素含量少的煤所形成的粉煤灰，可以作为土壤微量元素补充的改良剂来大量使用并获得较好的土壤改良和农作物增产的效果。

关键词：粉煤灰；土壤改良剂；种植环境；微量元素；发电厂

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