A Big Data Based Algorithm for Accurate Fertilization of Celery

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Abstract

China is a big agricultural country. Celery is one of the daily vegetables and is very popular among people. Nowadays, fertilizer abuse is widespread, which not only increases user spending, but also causes pollution of water and soil eutrophication and acidification. Accurate fertilization is extremely important. Supplementation of appropriate Mg fertilizer and Ca fertilizer will not only improve the absorption and utilization rate of celery compound fertilizer, but also increase the chlorophyll content of celery, improve photosynthesis, increase production and improve the quality of celery. In this paper, big data were obtained through a large number of experiments on celery, and the precise fertilization algorithm of celery was obtained through computational analyses.

Keywords

Big data, Celery, Accurate fertilization, Linear function.

1. Introduction

Celery has a long history of cultivation in China and is widely distributed. The celery is highly adaptable and can be produced in combination with the facilities. Celery is rich in protein, carotene, etc., especially the iron content is the first in vegetables. Celery has a high crude fiber content, so it is very popular among the world [1].

China is a country with a large population. It is also a big agricultural country. According to statistics, people's demand for the types and quality of vegetables is increasing, and rough agriculture can no longer meet people's needs [2].

Mg is an important component of plant chlorophyll. It is the only metal element in chlorophyll. It is an important component of various enzymes [3]. It can promote the conversion and metabolism of sugar in crops, promote photosynthesis, and be useful for the synthesis of fat and protein. It can improve the disease resistance and prevent the invasion of germs, and is one of the essential elements of plants [4-6].

Ca can stabilize cell membrane structure, reduce plant damage to salt and water stress, and improve plant resistance [7-8]. Ca can regulate the enzyme activity in plants, improve crop quality, reduce the formation of ethylene, delay tissue aging and sing the obsolete shelf life [9]. Ca can also maintain over-adaptation, resist fungal diseases, reduce bitter pox disease, and the incidence of water heart disease. One of the main reasons for the lack of Ca celery is that the young tissue turns brown and then gradually turns black. Finally, the surface of the stem becomes brown, dry and has a sour taste [10].

2. Research Background and Significance

The accurate management model and decision support system of agricultural production process are the digital basis of variable processing and generation, and the core link of the entire accurate information management of agricultural production [11]. Accurate crop is a near term of accurate agriculture, also known as accurate agriculture, accurate agriculture, crop positioning management and prescription agriculture. Accurate farming is a kind of agricultural production management technology based on the difference of different soil and environment, timing, positioning and quantitative input, so as to obtain the highest yield and quality with the least input, the highest

economic benefits and reduce unnecessary waste [12]. Crop growth model is an important tool for accurate agriculture.

MATLAB is Math Works' mathematical software for numerical analysis, matrix algorithms, visualization of scientific data, and modeling of nonlinear dynamic systems. In this paper, MATLAB as the analysis tool and data modeling, which was used to calculate the content of applied pure nutrients per mu, the height of celery plant, petiole width and the yield of celery as a linear equation, increase the adjustment factor, and obtain the best fertilization plan for celery.

3. Materials and methods

The variety of celery used in this experiment was celery, the compound fertilizer was 15-15-15, the Mg fertilizer was first-grade Mg sulfate, and the Ca fertilizer was dehydrated gypsum. The experiment was conducted in May 2019. Potted soil 2kg/ pot, equivalent to compound fertilizer was divided into six groups of 5kg/ $667m^2$, 10kg/ $667m^2$, 15kg/ $667m^2$, 20kg/ $667m^2$, 25kg/ $667m^2$ and 30kg/ $667m^2$. Ca and Mg fertilizers were pure nutrient quality. The trial was conducted in the laboratory in May 2019, with 25 trials, see Table 1.

Table 1 Treatments

No.	Compound Fertilizer (kg/ $667m^2$)	Ca (kg/ $667m^2$)	Mg (kg/ $667m^2$)
01	5	2	1
02	5	3	1.5
03	5	4	2
04	5	5	2.5
05	10	2	1
06	10	3	1.5
07	10	4	2
08	10	5	2.5
09	15	2	1
10	15	3	1.5
11	15	4	2
12	15	5	2.5
13	20	2	1
14	20	3	1.5
15	20	4	2
16	20	5	2.5
17	25	2	1
18	25	3	1.5
19	25	4	2
20	25	5	2.5
21	30	2	1
22	30	3	1.5
23	30	4	2
24	30	5	2.5
25	0	0	0

4. Results and analyses

The experimental date was 60 days. Data such as plant height and petiole width of the experimental plant were collected in July 2019, celery was harvested, and yield data per mu was calculated. The specific data are shown in Table 2.

Table2 Experimental results

No.	Plant Height (cm)	Petiole Width (cm)	Yield (kg/ 667m^2)
01	55.5	2.6	2234.45
02	56.2	2.8	2261.33
03	56.7	2.8	2504.69
04	57.3	2.7	2403.27
05	61.3	2.9	3054.35
06	68.2	3.0	3071.96
07	69.1	3.0	3386.73
08	69.2	3.0	3467.23
09	69.5	2.9	4118.80
10	72.1	3.0	4231.06
11	75.8	3.1	4326.57
12	75.2	3.1	4259.60
13	78.2	2.9	4935.14
14	79.1	2.9	4979.63
15	82.5	3.1	5011.83
16	81.2	2.8	5012.11
17	81.05	3.3	5596.18
18	83.9	3.3	5670.21
19	81.2	3.5	5924.00
20	80.6	3.2	5922.14
21	70.5	3.2	5218.62
22	78.6	3.1	5327.24
23	76.2	3.2	5372.96
24	40.6	2.4	2126.52

According to the data collected by the experiment, the height of celery plant, petiole width and yield were the best when applying 4kg Ca fertilizer and 2kg Mg fertilizer in the treatment. MATLAB used 24 groups of data processing, established linear equations, and integrated the influence factors of nutrients on celery, and concluded that every mu should be applied with pure nutrient Ca fertilizer 3-7.5kg/667m^2, and pure nutrient Mg fertilizer 1.6-4kg/667m^2.

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