

## Effect of GA<sub>3</sub>、NAA and Nutrient Element on Yield and Quality of Sunflower

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### Abstract

By using plant - grow - adjusts GA<sub>3</sub>、NAA and nutrient elements KH<sub>2</sub>PO<sub>4</sub>、H<sub>3</sub>PO<sub>4</sub>, made up of the liquids, the concentration were 100、100、1000、1000ppm Separately, mixed according to the proportion of 1:1:2:2, and spraied ultra - low - quantity on uniplant head during the sunflower bud prtiod. The results showed: the head diameter increased 14 - 18%, the 100 - seed weight increased 13 - 14%、the rate of empty - shell decreased 1 - 4%、the oil content increased 5 - 6% and the protein content increased 7 - 12%.

Key words: Sunflower   plant - grow - adjust   nutrient element

### Introduction

From the world range, sunflower has become important plant oil source and industrial materials, next to soybean, which has been studied from breeding、culture、physiology and other fields for increase yield and improvement kernel quality. This paper reported: Effect of plant - grow - adjusts and nutrient elements on yield and quality of sunflower.

## Materials and Methods

Field test was proceeded in Agricultural Test Station Jilin Agricultural University during 1992 + 1994. The sunflower offered were oil - used varieties: HeiYen88 and hybrid JS1612, the plant - grow - adjusts offered were  $GA_3$  (gibberellin acid) and NAA (methyl  $\alpha$ -naphthyl acetate), the nutrient elements offered were P, K, and B. Before treatment, mixed the 4 - kind liquids according to the proportion of 1 : 1 : 2 : 2, which were made of  $GA_3$ , NAA,  $KH_2PO_4$  and  $H_3BO_4$ , the concentration were 100, 100, 1000, 1000ppm separately. During bud period, sprayed ultra - low - quantity upon uniplant head (20 plants) having more or less dential grow - period, untill the heads were wet. CK was water. While the seed matured, single plant were harvested, tested separately seeds and determined oil and protein content of kernels.

## Results and Analysis

(一) Effect of plant - grow - adjusts and nutrient elements on yield character

### 1. Promoted enlargement of sunflower head

Sprayed by the liquid of Plant - grow - adjusts and nutrient elements P, K, B during bud period, no matter variety HeiYen 88 or hybrid JS1612, the diameter of heads all were enlarged clearly (Table 1). The head diameter of HeiYen88 increased 14.72%, JS1612 increased 18.87%. Enlargement of sunflower head is the first important factor of increase yield. As the effect of  $GA_3$  and NAA contained in the liquid promote cell enlength, so promote sunflower head enlargement also.

Table 1. Effect of plant - grow - adjusts and nutrient ele-

ments on yield character of sunflower  
(average values of the 3years)

varieties	treatment	head diameter (cm)	plump seeds (g/head)	empty shells (g/head)	100 - seed weight (g)
HeiYen88	treatment	20.11	94.33	2.18	11.63
	ck	17.53	81.05	2.21	10.15
JS1612	treatment	17.45	56.44	1.23	5.23
	ck	14.68	47.54	1.29	4.61

average values of 20 plants

### 2. Increased 100 - seed weight

100 - seed weight is another important trait of be make up of sunflower yield. To treat sunflower heads by the liquid of plant - grow - adjusts and nutrient elements, benefited to accumulation of dry - materials in kernel, made 100 - seed weight obvious increase (Table 1). e. g. treatment increased 14.58% than CK of variety HeiYen88, increased 13.45% of hybrid JS1612. It was utterly clear, increase of 100 - seed weight has to do with the action of  $GA_3$  and NAA that could "attract" and distribute photosynthesis products to kernel in one hand, in another hand concerns P. K. B. which promote transportation and transformation of organism materials.

### 3 Decreased the rate of empty - shell

From the data listed table 1 showed: It could increased plump degree, decreased the rate of empty - shell, that treated the sunflower heads by the liquid of plant - grow - adjusts and nutrient elements. Among them of HeiYen88 and JS1612, the plump kernels increased 16.39%, and 18.65%, the rate of empty - shell decreased 1.36% and 4.65% separately. The decrease of the empty shells after treatment had to do with B that promoted pollen germination and pollen - tube extension, be-

sides bore on  $GA_3$ , NAA, P, K and B that benefited to transportation and distribution of photosynthesis products to kernels, made the more tube - flowers complete fertilization, therefore, the rate of empty - shell was decreased.

(三) Effect of plant - grow - adjusts and nutrient elements on quality character of kernel

The determined results of oil and protein content were made a list 2. From the data of table 2: Spraying could increase oil and protein content of kernel, upon the sunflower heads by the liquid of  $GA_3$ , NAA, P, K, B. Oil content of HeiYen88, treatment increased 5.71% than CK, Protein content increased 12.62%. The 2 - kind items increased 6.50% and 7.59% separately of hybrid JS1612. According to analysis, the plant - grow - adjusts  $GA_3$  and NAA to be used all had the function of promotion protein bio - synthesis, nevertheless, P, K, B. 3 - elements took part in metabolism of N which was necessary in process of protein synthesis.

Table 2. Effect of plant - grow - adjusts and nutrient elements on kernel quality of sunflower

items	variety HeiYen88		hybrid JS1612	
	oil content (%)	protein content (%)	oil content (%)	protein content (%)
CK	43.26	21.48	44.93	23.57
treatment	45.73	24.19	47.85	25.36

Summarized: during bud period of Sunflower, to spray upon the head by the ultra - low - quantity mixed liquid of the physiological concentration of  $GA_3$ , NAA,  $KH_2PO_4$  and  $H_3BO_4$  not only increased yield but also improved the quality of kernel.