

六、玉米施肥時期試驗

一、前 言

玉米在生產過程中，對肥料之需求選擇不同，肥效必有所差異，本試驗之目的乃在探求玉米肥料施用量不同情形下之各該適當施肥時期，以供推廣用參考。

二、試驗材料及方法

(一) 供試品種：春作：永康一雜交玉米臺南5號。

新營一雜交玉米臺南8號。

秋作：東山仁德一雜交玉米臺南號5號。

(二) 試驗期間：1966年1月~12月。

(三) 試驗設計：隨機區組法，五重複，行長6m，行距0.6m，株距0.3m，6行區。

(四) 施肥量(kg/ha)及施肥期：

代號	施肥期	基 肥	20 天 後	30 天 後	40 天 後
1		150-80-80	—	—	—
2		75-80-40	75-0-40	—	—
3		100-80-80	—	50-0-0	—
4		50-80-40	50-0-40	50-0-0	—
5		100-80-80	—	—	50-0-0
6		100-50-50	—	—	—
7		50-50-25	50-0-25	—	—
8		50-50-25	—	50-0-25	—
9		40-50-25	30-0-25	30-0-0	—
10		50-50-25	—	—	50-0-25

(五) 土壤分析表：

地 點	土 壤 質 地	有 機 質 %	P. H	有效磷 鈣 kg/ha	有效性 鉀 kg/ha
永 康	砂 質 壤 土	1.36	6.8	210	83
新 營	"	1.74	6.2	511	325
東 山	"	1.00	7.6	177	210
仁 德	"	0.66	5.8	177	143

三、試驗結果

(一) 子實產量: kg/ha

地點 項目 代號	永 康		新 營		東 山		仁 德	
	產 量	指數%	產 量	指數%	產 量	指數%	產 量	指數%
1	7476	106	4097	95	5747	107	6173	107
2	7238	102	4396	102	6276	117	6013	105
3	7353	104	4331	101	6039	113	5855	102
4	6323	89	4424	103	5828	108	6057	105
5	7318	104	4438	103	5731	106	6154	107
6	6898	98	4226	98	5819	108	5959	104
7	6698	95	4333	101	5757	107	5965	104
8	6161	87	4229	98	5428	101	5940	103
9	7169	101	4445	103	5916	110	5958	104
10	7073	100	4306	100	5389	100	5746	100

(二) 變量分析表:

地 點	變 因		自 由 度	平 方 和	均 方	F 值
永 康	總	數	49	13100269		19.99**
	區	集	4	8625589	2156397	
	處	理	9	590674	65630	
	機	差	36	3884006	107889	
新 營	總	數	49	4113938		2.14
	區	集	4	680635	170159	
	處	理	9	569519	63280	
	機	差	36	286378.4	79550	
東 山	總	數	49	10839364		3.12*
	區	集	4	1964805	491201	
	處	理	9	3203128	356459	
	機	差	33	5666431	157401	
仁 德	總	數	49	12176821		14.60**
	區	集	4	7072759	1768190	
	處	理	9	737815	81979	
	機	差	36	4366247	121285	

四、檢 討

1. 經統計分析結果，處理間除東山試地顯著外，其他差異概不顯著。
2. 就肥料少量區而言，有一致傾向，即第 8 處理概收量為低，而第 9 處理均為優。
3. 就肥料多量區而言，除新營試地使用品種為臺南 8 號，耐肥性較低及仁德試地土壤較乾旱而前作為田菁各處理間未見軒輊情形特殊外，永康（春作）及東山（秋作）兩試地第 4 處理產量均乃低。
4. 永康，東山兩試地土壤水份控制條件頗優越，前者每一次施肥均有灌溉，後者土壤水份濕潤保持較久，而且前作物均為玉米及高粱等禾本科作物，致早期多施 N 肥為優。

五、結 論

1. 依成績判定上土壤水分之調整管理以及前作物之種類殆可左右其成績結果。
2. 肥料多量者在土壤水份適宜管理而且需 N 殷切情形下，N 肥以早期多施為優。
3. 肥料少量者一個月內三次分施優于二次分施（其追肥無論是在 20 天後 30 天後，或 40 天後）僅就永康東山第 6（全部基肥）與第 7（20 天後追肥）處理相互比較而論，亦有與肥料多量區所持第 2 點之傾向。

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ENGLISH SUMMARY

(by Soil and Fertilizer Section Senior specialist S.C. Liao)

The new variety Tainan Hybrid Corn No.5 was selected by this station in 1958, For the extension work of this new variety the field experiments of fertilizer on Corn had been carried out from 1959 to 1970. The results of these experiment divide to 2 groups, One is Elements requirement reserch, another is the Method of application include space time etc. Acknowledgement should be paid for 3 Soil and Fertilizer specialist Dr. S.C Chang, Dr. I.S. Pu, Dr. N.R.Su (J. C. R. R.) on Technical advice and financial assistance,

The Results include :

A. Elements Requirement Reserch

- I Study on Phosphorus and Potassium Fertilizer Recommendation through soil test for corn
- II Experiments on N—P—K corn fertilizer requirement
 - (a) Autumn and Spring part
 - (b) Winter interplant part
- III Response of corn to Magnesium
- IV Response of corn to Zinc

B. Method of Application

- V Effect of nitrogen fertilization and plant population on the protein content of corn
- VI Experiments on timing of corn fertilizer application

I Study on Phosphorus and Potassium Fertilizer Recommendation through soil test for corn (1967—1970)

1. We had 30 site trials on this study
2. The Effect of P.K fertilizer severely influenced by climats in Taiwan, esperially on low temperature and short daylight, in these case they would be show good effect on these fertilizer
3. In these trial we found the effect of Phosphorus highter than that of Potassjum. The Less Content of Effctive P_2O_5 , K_2O in soil, is the more effect of P—K fertilizer be increased.
4. According to 3 year result of trials we found

effective P_2O_5 in soil (kg/ha)	corn yield increase (%) by fertilization
<23	28—52
23—58	13.7—32
58—115	12.5—17.2
>115	5.1—11
effective K_2O in soil (kg/ha)	corn yield increase (%) by fertilization
0—62	21—27
62—125	9.2—14.3
125—250	6.7—12.6
>250	2—1.5

5. Fertilizer conference on July 8, 1970 determined phosphorus and Potassium fertilizer recommendation as follow : (unit kg/ha)

P ₂ O ₅ in soil	recommendation	K ₂ O in soil	recommendation
<120	75-100	<100	50-75
120-240	50-75	100-200	25-50
>240	0-50	>200	0-25

II Experiments on N-P-K corn fertilizer requirement

(a) Autumn and Spring part (1959-1961)

1. we carried out 23 sites on this trial all over this Province
2. Nitrogen is more necessary in all these locations
3. The effect of phosphorus and potassium are different between these location.
4. In the view of higher field fertility, the effect of fertilizer application is only 1.3-1.7 time as compared with no fertilizer. But the lower field fertility, the yield is more than 2-4 times compared with no fertilizer
5. The optimum ration of Fertilizer on the Hybrid corn are concluded 110:50:0-40
6. In the correlation between height (5 weeks after seeding are measured) and yield, the lower field fertility is more higher than the higher one.
7. In several field high yield group, its threshold contents of NO₃-N on tissue test (4 weeks after seeding) are 160 PPM in autumn crop.
8. Severe hunger signs on phosphorus and Potash are found in several field.
9. Potassium hardly to prevents attack of disease.

(b) Winterinterplant part (1968)

1. The effect of Phosphorus Fertilizer is most significance other than that of N, and K. It have some effect at any rate whethar soil test value is high or not and effect of N and K is rather low.
2. Its growth would be impeded, and yield of grain be decreased when soil test value is low or extreme low, at the treatment for no phosphorus and potassium application
3. At the economical consideration optimum ratio of N-P-K application are 90:50:100 in Yun-lin prefecture and 90:50:50 in Chia-yi prefecture respectively on silt loam.

III Response of corn to Magnesium (1966-1967)

Since soils condition are not the same, it find different effect between 6 locations

1. At Sheng-hwa, Potassium Content of soil is extremely high, on Mg₁K₁ (Mg₀=40 K₂O=50kg/ha) treatment its grain yield increase by 9% than Mg₀K₀ treatment
2. At Nan-si, Magnesium and Potash contents is all medium on soil analytical data, the effect of Potash evaluate to 1% significance level and that of Magnesium is not, but the yield of Mg₂K₂ (K₂O=100kg/ha) increase by 13%, Mg₁K₂ treatment increase by 21% Mg₁K₀ and Mg₂K₀ treatment increase

by 5% and 12% respectively.

3. At Pai-ho, soil K test belong to low, Mg is medium, at Mg_0K_2 and Mg_2K_0 treatment increase by 48% and 19% respectively Mg_1K_2 treatment increase by 49% Mg_1 and Mg_2 single application treatment increase 13 and 19%
4. At Liu-eng, the aim of this trial is for PH value influence on Magnesium application, the result show few influence on this element.
5. At Hu-wei, Maguesium single application in half and whole quantity increase by 6 and 14% respectively, but Mg_1K_1 and Mg_2K_1 treatments are all incre ase by 18% so it can't increase yield for more Mg addition.
6. At Chia-yi, the cite situate on dune belt, and damaged by drought in growth period so there is no any result to discuss

IV Response of Corn to Zinc (1967)

a. Pot experiments Prove :

1. Zinc is a necessary element for corn growth.
2. Zinc treatment make corn plant a low analysis of phosphorus and Potash
3. Effectiveness of Phosphorus and Zinc relate to content of P_2O_5 and Zn in soil, Their effect rely on the balance of the four.

b. Field Experiment prove :

1. Zinc is effective for corn to increase the yield, it increase grain yield by 15% with addition of 5.6—28kg/ha Zinc
2. When phosphorus analysis show medium in soil by use of 5.6kg/ha Zinc cause yield increase by 7.4—30%
3. When phosphorus analysis in soil is low, by no addition of phosphorus, Zinc use cause coutrary effect.

V Effect of nitrogen fertilization and plant population on the protein content of corn (1968—1969)

The standard cultivation and fertilizing are 120kg/ha N 60cm×30cm in spacing, and 2 times dressing on corn in this area. nowaday

4 Experiments proved :

a. about Grain yield

1. 3 experiments show that the less space is the more production acquired.
2. At Yi-tsu, in dense spacing, the more nitrogen applied the more yield increased. but in wider spaceing (30—40cm) its optimum N application restrict to 80kg/ha

At Yung-khan, in former year 120 kgN reach to peak of yield, but latter year its dressing should be divide to 3 times, otherwise 80kg N is sufficient.

At Matou its figure similar to Yun-khan.

3. The more dressing time increase, the more yield increased. but latter year two experiments show that it should be in dense spacing.

b. about Protein yield

1. At Yi-tsu, on standard fertilization (120kgN) it reached the highest Pro

-tein content.

at Yung-khan, 2 year results show that the more nitrogen applied the higher in protein content acquired

at Ma-tou in wider spacing it similiar to former one.

all locations prove that the wider spacing is, the higher Protein content have.

About dressing time some show 2 times, and another show 3 times are advant-
-ageous.

The highest content treatments are as follow :

location	treatment	dressig time	protein content(%)
Yung-khan (2 years)	40cm×160kg/ha N	all topdressing	9.99 and 9.73
Ma-tow	30cm×120 "	"	10.35
Yi-tsu	40cm×160 "	2 times dressing	9.43

The maximum is 10.35% Minimum is 6.98% all over the treatments.

2. On protein yield (total)

The more N application is enough the more protein yield increased, but Yi-tsu and Yung-khan (latte year) they reached peak in 120kg treatment, and contrary result have made at Matou for more N addition. On dressieg time some show that the more times is the more yield increased, and another show that 2 times is better than the other treatments, some no influence.

c. Conclusion (on total yield of protein)

Generally speaking, it would be reach to the highest yield of total protein by (1) dense spacing (30 cm and the distance between rows limited on 60 cm,) (2) enough nitrogen fertilizing and (3) more time dressing (2 or 3 times) but N-fertilizing should be determined by soil conditions, and the dressing time be restricted by irrigate situation.

VI Experiments on Timing of Corn fertilizer application (1963)

1. 4 locations, 2 in spring 2 in autumn, on statistical analysis have no any signi-
ficance result to desired
2. On the judgement of result, soil water regulation is a important element
to decide its expression. It would be lead some contrariety
3. At the more fertilization (NPK=150:80:80kg/ha) treatment if water supply
is moderate, It is better to suppling more fertilizer in early period.
4. At the less fertilization (NPK=100:50:50), 3 times dressing is better than
the 2 within one month.