QG KMS TRIAL REPORT

English Translation from Chinese Field Test Reports

1. Banana Field Test Report of KMS Fertilizer

By The Soil and Fertilizer Research Institute of Chinese Academy of Agricultural Science

1 Test materials and methods

There are 2 sites for the banana field test, one located in Huanputuan village, Zhongshan country, Guandong Province (Zhongshan); the another one is in Dasa banana garden, Dasa Village, Shihui City, Guandong Province (Shihui). The soil condition is shown in Table 1 by a soil test:

Table 1: The Soil Nutritional Condition of the Test Sites

Site	Organic Matter	Dissolve. Nitrogen	Effective nutrients mg/Kg									
	g/Kg	Mg/L	P	K	Ca	Mg	S	Fe	Mn	Zn	B	pH
Zhongshan	25.5	101.4	20.2	85.7	2480	355	111	269	366	6.1	0.244	6.3
Shihui	13.5	145.6	132	186	242	54.2	81.6	190	40.5	1.75	0.204	4.5

In general, the soil fertility in site Zhongshan is classified as medium to high. Rich in Mg and S; poor in K. The soil fertility in site Shihui is classified as medium. Rich in S and poor in Mg.

In each site 4 test blocks, each one 30.0 m^2 in area, were set up, between blocks there was a 50 cm wide footpath. The same test was repeated 3 times in one block. The same 3 tests were done in the 2 sites:

Test 1: comparison base (no test fertilizer added)
Test 2: K_2SO_4 fertilizer
Test 3: KMS fertilizer ($K_2.Mg.2SO_4.6H_2O$)

For Test 2 and Test 3, the potassium was applied at the same rate. The nitrogen and phosphate fertilizer usages were also applied at the same rate controlled the same in the 2 test sites. All the fertilizer usages are shown in Table 1. The fertilizers addition was separated into 14 sites.

In site Zhongshan, the total area is 59.3m^2, 10 banana were planted on 2.67m x 2.22m, the planting density was 1680 per hectare; In Site Shihui, the total area was 57.3 m^2, 12 banana were planted on 2.28m x 2.08m, the planting density was 2100 per hectare.

The test banana strains were the same – Brazil banana- in both sites. In Zhongshan site the banana was in the first fruiting stage, they were planted in 25th February 2004 (test- tube seeding), harvested in January to March 2005. In site Shihui the banana

was in the second fruiting stage, banana was harvested in December 2004 to February 2005. The growing details were recorded during the whole growing period. In harvest period all the banana fruits were weighed and analyzed. The yield of each banana tree was recorded.

Table 2: Fertilizer Usage Record

Test	Nutrients usage (Kg/ha)					Fertilizer usage (Kg/ha)			
	N	P2O5	K2O	Mg	S	Urine	(NH4)H2PO4	K2SO4	KMS
Zhongshan									
Base	975	240	0	0	0	1916	522	0	0
K2SO4	975	240	1200	0	432	1916	522	2400	0
KMS	975	240	1200	252	731	1916	522	0	5217
Shihui									
Base	1050	263	0	0	0	2060	570	0	0
K2SO4	1050	263	1290	0	465	2060	570	2580	0
KMS	1050	263	1290	270	785	2060	570	0	5609

2 Test results and discussion

2.1 How KMS affected the nutritional level of the banana leaves

The analytical results of the banana leaves in different growing stages show the application of KMS can obviously improve the nutritional level of banana

2.1.1 Site Zhongshan

In site Zhongshan (Table 2) the K2O content of banana leaves in nutritional growing stage in test 3 is 0.25% higher than that in comparison base, Mg content is 0.075% higher. In budding stage the K2O content of leaves in test 3 is 0.39% higher than that in comparison base, Mg is 0.071% higher.

Under the normalized equal potassium fertilizer usage level, the K2O and Mg content of banana leaves in test 3 (KMS case) is respectively 0.15% and 0.081% higher than that in comparison base in nutritional growing stage; 0.002% and 0.073% higher in budding stage.

2.1.2 Site Shihui

The basic situation is similar to site Zhongshan. The K2O and Mg content of banana leaves in nutritional growing stage in test 3 is respectively 0.54% and 0.135% higher than that in comparison base in nutritional growing stage. K content is 0.56% higher in budding stage. Under the normalized equal potassium fertilizer usage level, the K2O and Mg content of banana leaves in test 3 (KMS case) are respectively 0.06% and 0.112% higher than that in comparison base in nutritional growing stage; 0.002% and 0.121% higher in budding stage.

Table 3: Nutritional Situation of Banana Leaves in Different Growing Stages (%)

Test	Nutritional growing stage						Budding stage					
	N	P	K	Ca	Mg	S	N	P	K	Ca	Mg	S
Zhongshan												
Base	3.44	0.496	4.65	1.09	0.417	0.249	3.16	0.467	4.21	0.952	0.440	0.235
K2SO4	3.40	0.399	4.76	0.759	0.415	0.270	3.18	0.467	4.58	0.871	0.438	0.247
KMS	3.45	0.406	4.90	0.911	0.496	0.277	3.08	0.453	4.60	0.982	0.511	0.295
Shihui												
Base	2.96	0.555	5.09	0.709	0.184	0.320	2.69	0.425	4.95	0.709	0.262	0.194
K2SO4	3.06	0.636	5.57	0.618	0.207	0.345	2.97	0.467	5.49	0.597	0.270	0.200
KMS	3.10	0.633	5.63	0.640	0.319	0.439	2.87	0.495	5.51	0.709	0.391	0.206

2.2 How KMS affected the growing rate of banana stems

Application of KMS can affect the growing rate of banana stems. Results (Table 4) show in test 3 (KMS) all bananas grow faster than other cases in site Zhongshan, The stem height, stem diameter, green leaf number of single stem are much better than other cases. For example, in the nutritional growing stage, comparing with test 1 the stem is 7.4cm higher, diameter is 2.8cm more and green leaves are 1.3 pieces more. In budding stage the increasing figures are respectively 5.5cm, 1.4cm and 1 piece. Under the normalized equal potassium fertilizer usage level, in test 3 (KMS) comparing with K2SO4 case (test 2) the increasing number of stem height, stem diameter and green leaves are respectively 7.7cm, 2.6cm and 0.2pieces in the nutritional growing stage. In the budding stage the figures are respectively 3.2cm, 0.6cm and 0.3 pieces.

The recorded results in budding stage show the banana budding rate in test 3 (KMS) are much higher than other cases in both sites. In site Zhongshan, the budding rate in test 3 is 7.1 – 13.6% higher comparing with test 1 (comparison base). In site Shihui it is 16.6 – 33.2% higher.

All results indicate that in either Mg rich or poor, S rich situations KMS application can definitely improve banana growing, the stem height, stem diameter and left number of single banana will increase, the budding will be earlier too.

Table 4: Banana Growing Comparison

Test	Nutritional growing stage			Budding stage			
	Stem heigh (cm)	Diameter of stem (cm)	Left number	Stem height (cm)	Diameter of stem (cm)	Left number	Budding rate(%)
Zhongshan							
Base	139.8	34.1	11.4	238.3	59.9	11.9	81.8
K2SO4	139.5	34.3	12.5	240.6	60.7	12.6	70.4
KMS	147.2	36.9	12.7	343.8	61.3	12.9	88.9
Shihui							
Base	174.5	45.1	12.2	218.6	58.0	10.5	54.3
K2SO4	179.7	46.5	13.1	229.8	59.6	10.7	79.2
KMS	175.7	46.6	13.7	230.1	60.5	10.5	95.8

2.3 How KMS affected the quality and appearance of banana fruits

Investigating results of the matured banana fruits are shown in Table 5. In site Zhongshan the banana fruits of test 3 (KMS) are bigger, longer and heaver in terms of single fruit or a bunch of fruits. Comparing with base the banana bunch weight increased by 0.39Kg, single fruit length and fruit diameter increased by 0.65cm and 1.15cm respectively. The weight of the single fruit increased by 24g. Under the normalized equal potassium fertilizer usage level, the banana bunch weight from test 3(KMS) is 0.27Kg higher than that from test 2 (K2SO4), fruit length and fruit diameter increased by 0.62cm and 0.5cm respectively, single fruit weight increased by 17g.

Table 5: Comparison of Banana Fruit Quality and Appearance

Test	Bunch weight(Kg)	Number per bunch	Fruit length(cm)	Fruit Diameter(cm)	fruit weight(g)	Solid Content(%)	Soluble Sugar (%)	Vc (mg/100g)
Zhongshan								
Base	2.94	16	26.32	12.09	184	22.0	16.6	6.7
K2SO4	3.23	16	26.35	12.92	202	22.5	16.8	7.3
KMS	3.50	16	26.97	13.42	219	23.0	17.2	8.0
Shihui								
Base	2.29	18	22.03	12.22	127	21.0	15.3	7.7
K2SO4	2.39	18	20.12	12.30	133	21.5	15.3	7.7
KMS	2.40	18	22.25	12.48	138	21.5	15.8	7.7

Fruits test results show the total solids content, soluble sugar and vitamin C of the banana fruits from test 3(KMS) are respectively 1.0%, 0.6% and 1.3mg/100g higher than that comparing with the comparison base (test 1). Comparing with test 2 (K2SO4), the solids content, soluble sugar and vitamin C of the banana fruits from test 3(KMS) are respectively 0.5%, 0.4% and 0.7mg/100g higher. Under the normalized equal potassium fertilizer usage level, the total solids content, soluble sugar and vitamin C of the banana fruits from test 3 and test 2(K2SO4) are almost the same, but the appearance and surface brightness of the banana fruits from test 3(KMS) are much better. In site Shihui the appearance and surface brightness of the banana fruits from test 3(KMS) are similar to that from test 2 (K2SO4), but slightly better than that from test 1(comparison base).

2.4 How KMS affected the banana yield

In site Zhongshan the banana yield of test 3 (KMS) is the highest one (Table 5 and 6), up to 41546Kg/ha, is 4710Kg/ha or 12.8% higher comparing to test 1(base).Under the normalized equal Potassium fertilizer usage level the banana yield of test 3 is 1652Kg/ha or 4.1% higher comparing to test 2 (K2SO4).

Table 6: Banana Yield Comparison between Different Tests (site Zhongshan)

Test	Yield of each block (Kg/block)				Yield	Increase comparing to			
	1	2	3	Average	Kg/ha	Base Kg/ha	%	K2SO4 Kg/ha	%
Base	220.0	215.5	220.0	218.5	36827				
K2SO4	258.0	236.5	215.6	236.7	39894	3068	8.3		
KMS	262.0	233.5	244.0	246.5	41546	4719	12.8	1652	4.1

Table 7: Banana Yield Comparison between Different Tests (site Shihui)

Test	Yield of each block (Kg/block)				Yield	Increase comparing to			
	1	2	3	Average	Kg/ha	Base Kg/ha	%	K2SO4 Kg/ha	%
Base	200.5	184.6	192.1	192.4	33558				
K2SO4	207.3	209.4	223.5	213.4	37221	3663	9.8		
KMS	239.0	217.3	228.5	228.3	39821	6263	15.7	2600	6.5
*Equal KMS cost	227.4	209.0	230.9	222.4	38790	5232	13.5	1569	4.0

*Normalized to the same KMS cost level

3 Conclusions

The results of banana field tests carried out from 2004 to 2005 in site Zhongshan (soil fertility is medium to high, poor in effective K, but rich in Mg and S) and site Shihui (soil fertility is medium, K medium, Mg poor, but rich in S) show:

3.1 The application of KMS fertilizer can obviously improve the nutritional level of banana leaves and stems, and increase banana growth, height of banana tree, stem diameter and green leaf number.

3.2 The application of KMS fertilizer can improve the quality and appearance of banana fruits, increase the bunch weight, single fruit length, diameter and weight, increase stem diameter and green leaf number.

3.3 The application of KMS fertilizer can greatly increase banana yield. In the 2 test sites the banana yield increased 4719Kg and 6263Kg or 12.8% and 15.7% respectively comparing to the base test.

3.4 Under the normalized equal potassium usage to compare test 2 and test 3, application of KMS can better increase the Mg content of banana leaves, banana tree height and diameter, and green leaf number. In the 2 test sites the banana yield of test 3 increased 1652Kg and 2600Kg or 4.1% and 6.5% respectively than that of the K2SO4 case.

2. Sugarcane Field Test Report of KMS Fertilizer

By The Soil and Fertilizer Research Institute of Chinese Academy of Agricultural Science

1 Test materials and methods

The 2 sugarcane field test sites were respectively located in Laibin Town, Laibin County, Guangxi Province (**Laibin**) and Fusui village, Chongzuo County, Guangxi Province (**Fusui**). The soil types are red-earth and multi-calcium red-clay respectively. The soil analysis data are shown in Table 1. The sugarcane strains used are Xingtaitang-22 and Xingtaitang-16.

Table 1: Soil Analysis Data of the 2 Test Sites

Site	pH	Organic g/Kg	Main nutrients (g/Kg)			Fast release nutrients (mg/Kg)			Slow release K (mg/Kg)	CEC Cmol/ Kg
			N	P	K	N	P	K		
Laibin	5.8	15.54	1.78	1.45	36.63	101	10.0	121.0	148	17.98
Fusui	6.3	12.35	1.25	0.98	18.52	85	8.0	135.0	58	85.54

4 test blocks were set up in each site, test was repeated 4 times, the test sugarcanes were randomly planted. Each block was 33.3m^2 in area. In each test the nitrogen and phosphate fertilizer usages were the same, N: 345Kg/ha, P_2O_5: 174.3Kg/ha. In test 2 and 3 the potassium fertilizer usage was controlled as K_2O 450Kg/ha. The test started on 18th February 2004 and harvested on 18th December 2004 in site Laibin. The same test started on 25th January 2004, and harvested on 28th December 2004.

Test 1: comparison base, no K fertilizer added
Test 2: K_2SO_4 (equivalent to K_2O 450Kg/ha)
Test 3: KMS (equivalent to K_2O 450Kg/ha)

The K2O content in the K-Mg Sulphate fertilizer is 50% of K2O. The fertilizer distribution in sugarcane growing stage was: nitrogen fertilizer: 25% in planting stage; 50% in tillering stage; 25% in extending stage; Phosphate fertilizer: all put as base fertilizer in planting stage; Potassium fertilizer: 25% in planting stage, 50% at tillering stage and 25% in extending stage.

2 Results and discussions

2.1 How KMS affected the quality and appearance

The application of KMS can positively affect the quality and commercial appearance of sugarcane. The data of Table 1 and 2 show application of KMS and K2SO4 can not only obviously increase the number of sugarcane colony, but also improve the commercial appearance of the single sugarcane plant. Under a equal K usage, in test 2(K_2SO_4) and 3(KMS), the effective stalk number increased 5.4& and 7.1%; stalk height increased 30cm and 27cm; plant diameter increased 0.13cm and 0.12cm; single stalk weight increased 250g and 365g respectively comparing to test 1(base).The effect of KMS application to sugarcane colony and single stalk is almost the same as

K2SO4 case. The improvement of sugarcane stalk number and quality is the base for achieving a high sugarcane yield.

Table 2: The Effects of KMS Application to the Stalk Number of Sugarcane Colony and Single Sugarcane Appearance (site Laibin)

Test	Stalk height cm	Stalk diameter cm	Effective number Of stalks per ha	Single stalk Weight g
Base	285.5	2.45	60600	1145
K2SO4	315.5	2.58	64200	1395
KMS	315.5	2.58	63900	1395

Table 3: The Effects of KMS Application to the Stalk Number of Sugarcane Colony and Single Sugarcane Appearance (site Fusui)

Test	Stalk height cm	Stalk diameter cm	Effective number Of stalks per ha	Single stalk Weight g
Base	278.5	2.41	59100	1023
K2SO4	308.5	2.52	62700	1386
KMS	305.5	2.53	63300	1388

2.2 How KMS affected the sugarcane yield

There are some fertility differences between the 2 sites. In site Laibin the soil fertility is higher, the organic content is up to 17.82g/Kg. In site Fusui the soil fertility is lower, the organic content is only 12.35g/Kg. In terms of fast release K content the fertility of 2 sites are medium to high level, it is 121mg/Kg and 135mg/Kg respectively.

Based on the final results of fertilizer application, even for the higher fast-release K case (Fusui), KMS application still has an obviously positive result. Under the equal K usage condition (K_2O 450Kg/ha), In site Laibin the sugarcane yield of test 3 (KMS) was up to 89,100Kg/ha, 22,200Kg/ha or 33.2% higher than that of test 1(base). The sugarcane yield of test 2(K_2SO_4) was slightly lower than that of test 3 (KMS), but still 33.1% higher than that of test 1(base). In site Fusui the sugarcane yield of test 3 (KMS) was up to 87,975Kg/ha, 27,525Kg/ha or 45.5% higher than that of test 1(base), and 1020Kg/ha or 1.2% higher than that of test 2 (K_2SO_4). The sugarcane yield of test 2(K2SO4) was 85,950Kg/ha, 26,475Kg/ha or 43.8% higher than that of test 1(base). In general, both K_2SO_4 and KMS applications had a great positive result, no big difference was fund between the 2 tests.

2.3 How KMS and K_2SO_4 effected the sugarcane quality and sugar yield

Table 4: The Effect of KMS Application on the Sugarcane Quality and Sugar Yield (site Laibin)

Test	Sugar %	Fiber %	Reducing sugar %	Sugar yield* Kg/ha
Base	14.25	12.15	1.92	8103.3
K2SO4	14.58	12.12	1.86	11032.9
KMS	14.56	12.13	1.85	11027.0

*Calculated on 85% recovery rate

Table 5: The Effect of KMS Application on the Sugarcane Quality and Sugar Yield (site Fusui)

Test	Sugar %	Fiber %	Reducing sugar %	Sugar yield* Kg/ha
Base	13.58	12.25	1.95	6977.7
K2SO4	13.62	12.62	1.88	10063.3
KMS	13.75	12.53	1.89	10282.1

*Calculated on 85% recovery rate

The sugar yield is the most important factor of sugarcane quality. Test results indicate that application of KMS or K_2SO_4 both can greatly increase sugar yield, and the final results are very close. In site Laibin and site Fusui, under a equal K usage, the sugar yield are respectively 2924Kg/ha and 3304Kg/ha or 36.1% and 47.4% higher than that of comparison base (test 1).

3 Conclusions

The results of sugarcane field test of KMS application, carried out in Laibin and Fusui Guangxi Province in 2004, show:

3.1 Application of KMS apparently improved the growth rate of sugarcane colony and the appearance of single sugarcane in both test sites. In site Laibin and Fusui, under a normalized equal K usage condition (K_2O 450Kg/ha), the number of effective stalks increased 5.4% and 7.1%, single stalk height increased 30cm and 27cm, stalk diameter increased 0.13cm and 0.12cm, single sugarcane weight increased 250g and 365g respectively comparing to the base case.

3.2 Application of KMS apparently increased the yield of sugarcane in both sites. In site Laibin and Fusui, under a normalized equal K usage condition (K_2O 450Kg/ha), the sugarcane yield increased 22,200Kg/ha and 27,525Kg/ha or 33.1% and 45.5% respectively comparing to the base case. There were no big difference of sugarcane yield between test 2(K_2SO_4) and test 3 (KMS)

3.3 Application of KMS apparently increased the yield of sugar in both sites. In site Laibin and Fusui, under a normalized equal K usage condition (K_2O 450Kg/ha), the sugar content increased 0.31% and 0.17%, the sugar yield increased 2924Kg/ha and 3304Kg/ha, or 36.1% and 47.4% respectively comparing to the base case. There were no big difference of sugar yield between test 2(K_2SO_4) and test 3 (KMS)

3.4 Under a normalized equal K usage condition (K_2O 450Kg/ha), in site Laibin and Fusui the ratio of output/input was 1.35 and 1.92 respectively, slightly higher than that of K_2SO_4 case (1.28 and 1.73 respectively)

3. Tomato field test report of KMS Fertilizer

By The Soil and Fertilizer Research Institute of Chinese Academy of Agricultural Science

Abstract

A tomato field test was done in a liming soil type to check the efficiency of application of KMS fertilizer. Comparing to the comparison base the application of KMS can apparently increase tomato yield. Under a normalized equal cost condition, the tomato yield increased 18.8% comparing to the K_2SO_4 application case. Under a normalized equal K usage condition, the tomato yield is also higher than K_2SO_4 application case, up to 14.4%. The test results prove KMS is at least as good as K_2SO_4 for tomato production.

Key words: tomato, KMS, K_2SO_4

KMS is a sulphate-containing potassium fertilizer. K_2O: 23%, MgO: 8%, S: 14%.Because of its high K, Mg and SO4 contents, it can be preferably applied in the K and Mg defected soil, especially good for some S-loving corps. In 80' of last centre an American K-Mg sulphate fertilizer (IMC Company) was imported and tested for tobacco, sugarcane and peanuts. All the results show a very positive effect. In 2003 a new K-Mg sulphate fertilizer, called KMS, was produced from the pilot plant of Qinghai Guoan. In order to check the effect of KMS application on vegetables we chose tomatoes to do field test in the Fanshan area, Beijing City.

1 Materials and methods

The test site was in the experimental filed of The Agricultural Institute, Fangshan County, Beijing City. The nutrients contents of the cultivating bed soil are: organic matter: 28.3g/Kg; total nitrogen: 2.5g/Kg; Alkaline-soluble nitrogen: 132.3mg/Kg; fast-release phosphate: 20.1mg/Kg; fast-release potassium: 432mg/Kg; pH 8.0. In general, the soil contains relatively high organic and fast-release phosphate, which representing the higher fertility soil type of vegetable fields in Beijing area.

4 test blocks were set up in each site, the test was repeated 3 times, the test tomato seedlings were randomly planted, each block was 30 m^2 in area. In each test the usage of nitrogen and phosphate fertilizer was the same, N: 450Kg/ha and P_2O_5: 12Kg/ha respectively.

Test 1: comparison base (no K fertilizer added)
Test 2: K_2SO_4 (equivalent to K_2O 450Kg/ha)
Test 3: KMS (equivalent to K_2O 450Kg/ha)

For nitrogen fertilizer, 20% as base fertilizer; 80% as topdressing. For phosphate 100% as base fertilizer. For potassium 30% as base fertilizer, 70% as topdressing. The tomato was planted on 30th April 2004 and harvested on 30th June 2004.

2 Results and discussions

2.1 How KMS effected the tomato yield

In Figure 1, the tomato yields of the 3 repeated sub-tests of the same test are almost the same, but there are big yield difference between different tests. The lowest one is test 1(base), only 54722Kg/ha; the highest one is test 3(KMS), up to 65400Kg/ha, 19.5% higher than base case.

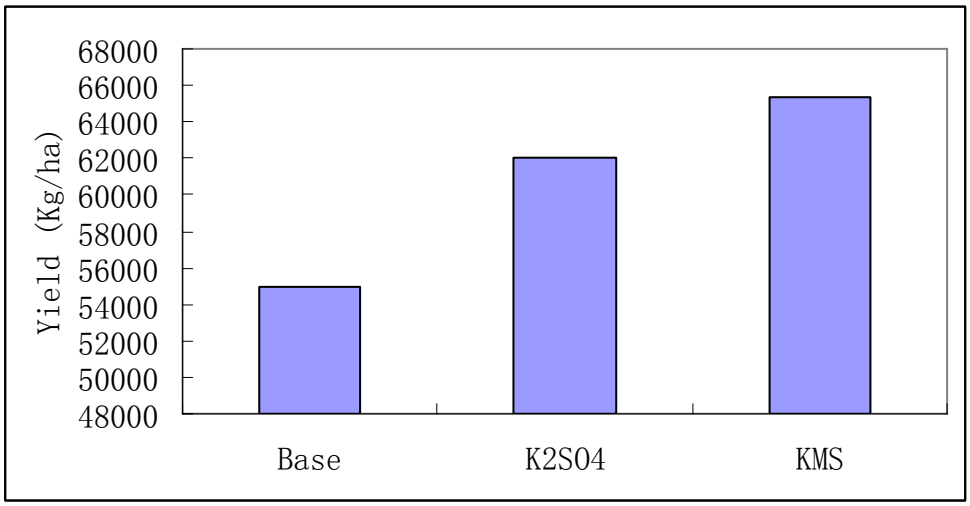

Figure 1: Tomato Yield Comparison between Different Tests

The tomato yield of test 3 is higher than that of test 2(K2SO4). Under a normalized equal potassium usage condition, the tomato yield of test 3 (KMS) is 74,800Kg/ha, which is 14.4% higher comparing to test 2 (K_2SO_4), or 36.7% higher comparing to test 1(base)

3 Conclusions

From this experiment it is proved that even under a fast-release potassium condition, the application of KMS can apparently increase the tomato yield. Under an equal K usage level the tomato yield of test 3 (KMS) is 14.4% higher comparing to test 2 (K_2SO_4). As KMS is much cheaper than K_2SO_4, so under an equal input level the yield increasing range is much larger than K_2SO_4 case, the reason is probably the Magnesium plays an important role. Mr. Weiqiguan's research results also indicate that on top of KPK fertilizer adding extra magnesium fertilizer can greatly improve tomato growth rate, increase yield and the weight of single tomato fruit. The yield increasing range is up to 7.5%. In the liming-soil the high Ca^{++} content limited the plant from absorption of Mg^{++}, so addition of magnesium fertilizer can supplement the insufficient Mg^{++} of the soil.

4. Water melon field test report of KMS fertilizer

By The Soil and Fertilizer Research Institute of The Academy of Agricultural Science (Fujian Province China),

A water melon field test of KMS (from Qinghai Guoan) fertilizer application has been done in 2004 in Fujian Province.

1 Materials and Methods

1. Test materials: The test site was in Taigeling, Fuzhou City. The soil nutritional conditions of test site are: organic: 18.0g/Kg; total nitrogen: 1.91g/Kg; total potassium: 21.26g/Kg; total phosphate: 0.50g/Kg; alkaline-dissolved nitrogen: 101.75mg/Kg; fast-release phosphate: 34.59mg/Kg; fast-release potassium: 65.86mg/Kg, pH 5.28.

The water melon strain was “Heimi” (black holey), which was supplied by Huannong Seeds Company, Fujian Province. The KMS fertilizer was from Qinghai Guoan Company; The Russian made compound fertilizer (N+P+K:48% at 16-16-16) bought from the market; Urea containing N 46%, from Shanming Chemical Plant; Ammonium monohydric phosphate (Mono Ammonium Phosphate), containing N 15%, P_2O_5 42%); K_2SO_4(containing K_2O 50%); and Canadian KCl or MOP Muriate of Potash (containing K_2O 60%).

2. Experiment design: 5 tests, each repeated 3 times. Water melon planted randomly. Test design based on equal K intake. In 666.7m2 area, K_2O: 20Kg; N : P_2O_5 : K_2O = 1:0.5:1.0. Fertilizers added were: 1) 48% Russian compound fertilizer (containing Cl). 2)NP (urine + Ammonium monohydric phosphate, Urea + Mono Ammonium Phosphate for comparison base).3) NP+K_2SO_4 (urine + Ammonium monohydric phosphate urea + Mono Ammonium Phosphate + K_2SO_4). 4) NP+KMS (urea+ Ammonium monohydric phosphate + KMS).5)NP+KCl(urine + Ammonium monohydric phosphate + KCl). In different growing stages the fertilizer distribution was: base fertilizer: 30%; Seeding fertilizer: 10%; vine-extending fertilizer: 20%; fruit growing fertilizer: 30%; rejuvenation fertilizer: 10%.

3, Tests: the double-ridge block was 2.5m wide, the distance between 2 plants was 0.8m. Each test block was 20m^2 in area, 20 what planted on it. In 9th of March the base vine-extending fertilizer was added on 11th of April, the fruit growing fertilizer was added on 12th of May, the rejuvenation fertilizer was added on 2nd of June. The method of field management was the same. The harvest started on 1st of June and finished on 10th of June.

2 Results and discussions

2.1 Yields comparison in different tests

According to Table 1, comparing to NP test, the water melon yields in different potassium fertilizers or compound fertilizer applications were increased in different levels, indicating potassium addition can apparently increase water melon yield. Among them the NP+K2SO4 case had a best result, 11.5% higher than comparison

base. The second best was NP+KMS, 9.1% higher. 48% compound case and NP+KCl case the yield were 8.7% and 6.6% higher respectively. Based on the mathematic analysis for the test NP+K_2SO_4, test NP+KMS and test 48% compound, the results were slightly different, but much higher than that of base (only NP, no K fertilizers).

Table 1: Yields Comparison in Different Tests

Test details	Yield in one block (Kg)			Average yield Kg/block	Yield Kg/666.7m^2	Creasing Rate (%)
	I	II	III			
48% compound	76.0	78.3	77.3	77.5	2583.5	8.7
NP (base)	70.2	73.7	70.1	71.3	2376.9	
NP+K_2SO_4	78.3	80.5	79.7	79.5	2650.1	11.5
NP+KMS	78.3	76.7	78.5	77.8	2593.5	9.1
NP+KCl	77.6	75.7	74.6	76.0	2533.5	6.6

5%LSD=2.55;1%LSD=3.71

2.2 Water melon quality and appearances comparison between different tests

In Table 2 comparing with base (NP) all other fertilizer combinations can increase the weight of single melons 2.8 – 17.3%. Among them the highest one is NP+KMS test, the weight of single melon is up to 5.48Kg. The second best is NP+K2SO4 test, the weight of single melon is 5.19Kg. In terms of bearing-melon node location, the highest one is NP+KCl test, up to 19.3, the lowest is NP+KMS test, only15.3, others test are 16-19. A lower bearing-melon node means a earlier date to the market, and a higher commercial value of the melon.

Table 2: Water Melon Quality and Appearances Comparison between Different Tests

Test details	Single melon wt.(Kg)	Bearing-melon node location	Total node number	Vine length (m)	Longitudinal diameter (cm)	Crosswise Diameter (cm)	Melon skin thickness (cm)
48% compound	4.80	16.0	37.7	3.98	20.3	20.5	1.1
NP (base)	4.67	19.0	40.3	3.77	20.0	20.2	1.0
NP+K_2SO_4	5.19	17.0	40.7	4.06	22.0	21.3	1.0
NP+KMS	5.48	15.3	36.7	3.83	23.3	21.0	1.0
NP+KCl	4.98	19.3	36.7	3.45	20.7	20.7	1.1

2.3 Water melon sweetness in different tests

From Table 3 it is clear that the sequence of the centre sweetness is NP+KMS > NP+K_2SO_4 > NP+KCl > 48% compound > NP (base). Compared to the NP test, all other fertilizer combinations can effectively increase water melon's centre sweetness. Among them the highest is NP+KMS, up to 8.1%. In terms of edge sweetness, the highest is NP+K_2SO_4 (8.2%), the second is NP+KMS (8.1%). In general, the of sweetness increasing by K2SO4 or by KMS application are almost the same, but much better than KCl or NP case.

Table 3: Water Melon Sweetness in Different Tests

Test details	Centre sweetness	Edge sweetness
48% compound	9.20	7.40
NP (base)	9.13	7.40
NP+K_2SO_4	9.80	8.20
NP+KMS	9.87	8.10
NP+KCl	9.30	7.53

2.4 Economic efficiency comparison between different tests

Data in Table 4 show among these tests the highest output value is NP+KMS, up to AU$390/666.7m^2, the second is NP+K2SO4, up to AU$353/666.7m^2. In terms of total fertilizer cost (for 666.7m2), the highest is 48% compound (AUD$41.25), the second is NP+KMS (AU$31.66). The sequence of net output value of different tests is NP+KMS > NP+K_2SO_4 > NP+KCl > 48% compound > NP. Comparing with NP base case, all other fertilizer combinations tests got different value adding, AU$2.85 – 56.83 range.

Table 4: Economic Efficiency Comparison between Different Tests

Test details	Yield Kg/666.7m2	Output Value AU$/666.7m^2	Fertilizer cost AU$/666.7m^2	Net output Value AU$/666.7m^2	Value adding Comparing to NP AU$/666.7m^2
48% compound	2583.5	344.46	41.25	303.22	2.83
NP (base)	2376.8	316.90	16.51	300.33	
NP+K_2SO_4	2650.1	353.33	31.51	321.83	21.45
NP+KMS	2593.5	389.03	31.73	357.30	40.25
NP+KCl	2533.5	337.80	25.43	307.86	11.98

*Urea: AU$255/t; K_2SO_4: AU$375/t; KMS AU$175/t; KCl: AU$265/t; 48% compound: AU$330/t; Mono Ammonium Phosphate: AU$313.3/t. Whole sale price: AU$0.15/Kg for NP+KMS water melon; AUD$0.13/t for others

** Currency exchange rate between AUD and RMB: 6:1

3 Conclusions

1. Under a nitrogen + phosphate base fertilizer, addition of KMS can get a similar water melon yield increase as K2SO4 or compound fertilizer case, but much higher than NP base case

2. Under a nitrogen + phosphate base, addition of KMS, the single melon weight is 0.81Kg heaver, the bearing node location reduced by 3.7 it will put water melons on the market much earlier, subsequently increase the economic value. The centre sweetness, edge sweetness is similar to K_2SO_4 case, but much higher than NP base case.

3. Under a nitrogen + phosphate base, addition of KMS can apparently increase the economic efficiency of water melon comparing with K_2SO_4 and KCl applications, up to AUD$35.46/666.7m^2 and AUD$44.94/666.7m^2 respectively.

4. Test results show under a nitrogen + phosphate base, addition of KMS can increase economic efficiency AUD$54.08/666.7$m^2$ comparing with compound case.