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Formulation of Organic Fertilizer Standard in Jiaxing City Based on NY525 – 2012

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Abstract On the basis of research, analysis and argumentation, we conduct analysis and research on the current situation of quality of commercial organic fertilizer in Jiaxing City, and carry out the inspection and testing of organic matter indicators using the laboratory. Based on the standard of NY525 – 2012 Organic Fertilizer by the Ministry of Agriculture, this paper formulates the quality level indicators of local commercial organic fertilizer and adding specifications of raw materials.

Key words Organic fertilizer, Jiaxing, Local standard

The standard of NY525 – 2012 *Organic Fertilizer* by the Chinese Ministry of Agriculture was released on March 1, 2012, and implemented on June 1, 2012. This standard replaces the previous versions, the standard of NY525 – 2002 *Organic Fertilizer* and the standard of NY525 – 2011 *Organic Fertilizer*. Due to different sources of organic fertilizer in various regions and great differences in the quality, it is necessary to develop the standard of *Organic Fertilizer* suitable for the local areas on the basis of the standard of NY525 – 2012. The local standard of DB3304/T020 – 2012 *Organic Fertilizer* in Jiaxing City was released on June 25, 2012 and implemented on September 1, 2012. It aims to provide the technical basis for the local production companies to fully utilize animal manure to produce organic fertilizer, promote the quality of product, and improve the government and the agricultural departments' quality monitoring of organic fertilizer.

1 Raising of problem

1.1 The quality of pig manure in Jiaxing City The main raw materials of commercial organic fertilizer in Jiaxing City are mainly the pig manure or chicken manure. The breeding scale and level of pig in this city is continuously improved. There are 3 million

pigs in the stock all the year round, and the annual raising amount stays around 7.7 million. In some areas, the carrying capacity of land for pigs reaches 45 to 90 per·hm². The general formulation of the concentrated feed: corn (50 to 60%), soybean (25%), flour (6 to 10%), fish meal (5 to 10%), additive (2%). Thus the nutrient content of the pig manure is high. According to the recent testing, the total nutrients of N, P₂O₅ and K₂O can reach 10% or more, and the organic matter content can be up to 40% (NY525 – 2002 standard).

Table 1 Testing of the quality of pig manure in Jiaxing City

Total nutrient	N	P ₂ O ₅	K ₂ O	Organic matter	pH
10 – 12.7	2.2 – 3	5 – 7	2.3 – 3.2	40 – 60	6.0 – 8.5

1.2 The overall nutrient of commercial organic fertilizer is high, but there are great differences in the quality In the period 2009 – 2011, the provincial quality testing agency tested 15 organic fertilizer enterprises in the city. The statistical results concerning quality testing of organic fertilizer (in accordance with the standard of NY525 – 2002 organic fertilizer) are seen in Table 2.

Table 2 Quality testing statistics of commercial organic fertilizer in Jiaxing City

Statistical content	Total nutrient	N	P ₂ O ₅	K ₂ O	Organic matter	Moisture content	pH value
Mean	9.11	2.53	4.22	2.38	46.91	10.75	Median 7.5
Standard deviation	1.77	0.66	1.52	0.69	6.79	5.19	0.67
Maximum value	12.2	4.23	6.78	3.78	62	22	8.81
Minimum value	5.4	1.76	1.3	1.04	34	1	5.9

At present, the main raw materials of commercial organic fertilizer are pig manure or a small amount of chicken manure. Due to difference in the organic ingredients and adding proportion, there is a great different in total nutrients and organic matter. According to the testing statistics of 30 commercial organic fertiliz-

ers, total nutrients of N, P, K average 9.11% (the maximum of 12.2%, the minimum of only 5.4%). By grouping, total nutrients of N, P, K greater than 10% account for 26.66%; total nutrients of N, P, K greater than 8% – 10% account for 46.66%; total nutrients of N, P, K greater than 6% – 8% account for 20%; total nutrients of N, P, K greater than 5% – 6% account for 6.66%. In accordance with NY525 – 2002 standard, the organic matter of organic fertilizer in the city in the previous three

years averaged 46.91% , with the maximum of 62% and minimum of 34% . Due to great differences in the quality of commercial organic fertilizer, according to NY525 – 2012 standard, total nutrients of commercial organic fertilizer $\geq 5\%$, while total nutrients of the local pig manure can reach 10% . It is still difficult to tell the quality of the pros and cons. Thus some organic fertilizer enterprises exploit an advantage to blend other organic and inorganic raw materials, damaging farmers' interests, so that government's organic fertilizer subsidy bidding is difficult to be objective and fair; at the same time, it also damages the organic fertilizer enterprises' own credibility.

1.3 The quality threshold of NY525 –2012 organic fertilizer standard is too low, making the quality differences fuzzy

Although total nutrients of N, P, K is increased from 4% to 5% and the organic fertilizer production enterprises in Jiaxing City

Table 3 Testing results of organic matter in a group of organic fertilizer samples using different standards

Standard version	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Average	Regression analysis
NY525 – 2002	21.62	45.92	54.60	42.91	28.37	38.684	$y = 0.7102x - 0.3966$ $r = 0.9991^{***}$, x (New standard)
NY525 – 2012	31.32	65.40	78.10	59.38	40.73	54.986	

From the testing using old and new standards, there is highly significant correlation between the two groups of testing results ($r = 0.9991^{***}$). Based on NY525 – 2002 standard, the organic matter tested averages 38.684% , and based on NY525 – 2012 standard, the organic matter tested averages 54.986% . The main difference between the two groups of testing results is that NY525 – 2012 standard testing value is multiplied by 1.5 of coefficient of oxidation. The content of organic matter in the organic fertilizer tested using NY525 – 2012 standard is signified by the mass fraction of fertilizer. The organic matter is calculated as follows:

$$w(\%) = \frac{c(v_0 - v) \times 0.003 \times 100 \times 1.5 \times 1.724 \times D}{m(1 - x_0)}$$

where 1.5 is oxidation correction coefficient. Other content of calculation method of the two standards is the same.

If testing the organic matter using NY525 – 2012 standard, although the test method is subject to change, the organic matter content derived using the testing value to multiply 1.5 coefficient of oxidation, can not compare with the testing results of plant and soil organic matter, and the actual meaning is not clear. Organic matter in organic fertilizer is not improved in reality, which is not conducive to improving the quality supervision of organic fertilizer. Since organic matter in NY525 – 2012 standard is a mandatory standard, we pose the problem but not modify it when formulating Jiaxing local standard Organic Fertilizer.

Table 4 Quality level of commercial organic fertilizer in Jiaxing City

Item	Organic fertilizer level and indicators		
	First level	Second level	Third level
Mass fraction of organic matter//%	≥ 55	≥ 50	≥ 45
Mass fraction of total nutrients (nitrogen + phosphorus pentoxide + potassium oxide) //%	≥ 9.0	$\geq 7.0 < 9.0$	$\geq 5.0 < 7.0$
Mass fraction of water (fresh) //%	≤ 25	≤ 25	≤ 30
pH	5.5 – 8.5	5.5 – 8.5	5.5 – 8.5

using pig manure as raw materials can be all qualified, we still do not see the differences in quality. The above test results show that pure pig manure N, P, K nutrients in the city can be more than 10% . If taking pig manure or chicken manure as the main raw material, total nutrients of commercial organic fertilizer can reach more than 9% , and organic matter can reach more than 40% (NY525 – 2002 standard).

1.4 The actual meaning of testing value $\times 1.5$ of organic matter in the NY525 – 2012 organic fertilizer standard is not clear

In order to compare the differences in the content of organic matter in organic fertilizer tested using NY525 – 2002 standard and NY – 2012 standard, we apply two standards to conduct organic matter testing on 5 organic fertilizer samples in the same group, respectively, and repeat five times or more. The testing results are shown in Table 3.

2 Formulation of Jiaxing local standard Organic Fertilizer

2.1 Differentiation of the quality level of commercial organic fertilizer

According to the quality characteristics of livestock, poultry manure and commercial organic fertilizer in Jiaxing City, on the basis of NY525 – 2012 standard, we formulate Jiaxing local standard, dividing the quality of commercial organic fertilizer into three levels. NY525 – 2012 standard is the local third level standard; the standard of organic matter, total nutrients and moisture content in the first level and second level is improved, as shown in Table 4.

2.2 Adding specifications of organic fertilizer raw materials

Article 4.3 in the new standard in Jiaxing City provides that "The raw material used for the first and second level organic fertilizer is mainly the animal waste; a small amount of other organic materials are allowed to be added due to the fermentation process; inorganic materials (including chemical fertilizer) are prohibited". The number concept that raw material used for the first and second level organic fertilizer is mainly the animal excreta should reach more than 70% ; a small amount of other organic materials are allowed to be added due to the fermentation process, but the amount must not exceed 30% ; other organic materials should not be blended after the fermentation, inorganic materials (including chemical

ments, energetically transform development model, lay special stress on construction quality and actual effect of operation, rather than pursuing only development quantity and scale.

4.4 Strengthening guidance and supervision to constantly improve management

The development course of Chinese tobacco farmers' specialized cooperatives is very short, so its organization structure is not proper, internal management not scientific and institutional construction not perfect. In this situation, government should constantly strengthen and improve guidance and supervision; tobacco and agricultural economic departments should actively provide timely and effective service of information, technology and protection of rights and interests, to guide tobacco farmers' specialized cooperatives to standardize regulations, improve system and enhance management. Besides, separate and extensive production models are not suitable for tobacco farmers' specialized cooperatives, and impede development and expansion of farm-oriented production^[4-5]. Therefore, it should introduce modern corporate management system, establish "equal, fair and open" scientific performance assessment system, and implement standardized production.

4.5 Stressing position of service subjects and improving level of specialized service

In agricultural production, tobacco production has many sections and the process is very complex. To relieve tobacco farmers from so difficult technology and high labor intensity, we must take the road of specialized cooperation. Therefore, it should stress position of tobacco farmers' cooperatives and expand their service functions. It is recommended to build tobacco

farmers' specialized cooperative into an organization that provides specialized service, comprehensive utilization and supervision of facilities, tobacco production, supply of agricultural means, and technical guidance, and market subject of contracting agricultural engineering projects, so as to improve their self-management ability. In addition, it should strengthen technical training of service teams for tobacco farmers' specialized cooperatives, and improve professional quality of service teams. Members of agricultural machinery operation, plant protection, baking and classification service teams should not go to post without corresponding license.

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fertilizer) are prohibited to be added in the organic fertilizer, and individual enterprises should be prevented to blend other inorganic raw materials.

3 Quality standard assessment of organic fertilizer in Jiaxing City

Based on the newly formulated local standard of organic fertilizer in Jiaxing City, the organic fertilizer with the quality reaching the first level standard in the period 2009 – 2011 accounted for 66.66%, the organic fertilizer with the quality reaching the second level standard accounted for 83.33%, and even the organic fertilizer with poor quality accounted for 16.66%. In accordance with the testing results of organic matter using NY525 – 2002 standard, we estimate the organic matter content using NY – 2012 standard: The proportion of organic matter reaching the standards of third level (45%), second level (50%) and first level (55%) can be up to 100%, 95%, 90%, respectively.

4 Pending issues left over

Two issues are yet to be solved in the newly formulated Jiaxing local standard. The first is the issue of too high heavy metal in some samples of organic fertilizer. After testing the content of heavy metal in 20 samples of organic fertilizer, in accordance with NY525 – 2002 standard, the heavy metal content meets the standard requirements; but in accordance with the new NY525 – 2012 standard, mercury is 10% over the set standard and arsenic is 35% over the standard. Moreover, lead in the organic fertilizer ≤ 50 mg/kg and chromium ≤ 150 mg/kg, both less than 250 – 350 mg/kg of lead and 250 – 350 mg/kg of chromium in the second level standard of soil. Therefore, the local areas should actively and strictly control the source of organic fertilizer-feed additive, to prevent the high content of heavy metal in organic fertilizer. The second is that the actual basis and application effect of oxidation correction coefficient of testing value of organic matter based on NY525 – 2012 are debatable. It is recommended that when revising the national standard of organic fertilizer industry, the related experts should take account of the two issues.