03

Causes and measures of loss of whole chain after grain production

Key issues leading to food loss at present

① Harvest link

Mechanical harvesting leads to crop loss and damage, with higher rate of harvest loss with domestic equipment;

② Farmer grain storage link

Grain storage technology and conditions are not good, and facilities at grain collection and storage points at the grass-roots level are not good;

③ Logistics

Rural fields lack closed, specialized grain transport vehicle equipment;

④ Processing links

The standard system of moderate processing of grain and oil is not perfect, and the promotion of moderate processing equipment still needs more efforts.

3.1 Main links of food loss

3.1.1 Production process

① Waste of seeds

Seed germination rate is low, sowing machinery quality problems

② Sowing loss

The sowing operation technology is not good, the sowing date is improper, and the traditional planting method uses too much seed

③ Loss of harvest

The farmland infrastructure is backward, the harvest is not timely, and the precision operation level of harvesting machinery is not high

3.1.2 Storage, transportation and processing

① Storage loss

Aging storage facilities and unreasonable layout;

② Transportation loss

Standardization of transportation is not high, lack of rural logistics equipment, transportation organization is not scientific;

③ Processing loss

Excessive processing, backward processing technology, resulting in flour, rice production rate is not high.

3.1.2 Main causes of food loss

1.Activity of life

2.rat

3.injurious insect

4.fungus

5.heavy metals

1 Vital activities

①、The breathing of grain

Food respiration is a process in which nutrients inside the grain are constantly consumed. In the process of respiration, nutrients inside the grain and oxygen into the grain become carbon dioxide and water and heat are released. Therefore, food respiration on the one hand maintains the life of seeds, and on the other hand consumes nutrients inside the seedsThe stronger the respiration, the more nutrients will be consumed, the more water and heat will be released and accumulated, and the more unfavorable it will be to the storage of food. Therefore, we should not only maintain the respiration of food, but also try to reduce its respiration as far as possible.

1 Vital activities

Effect of respiration on stored grain:

The stronger the respiration, the greater the dry matter loss. The moisture produced by respiration increases the water content of grain and oil, resulting in decreased storage stability, such as: sweating phenomenon

Some of the energy generated by respiration is released to the grain pile in the form of heat, which is easy to increase the grain temperature and lead to heating of the grain pile in serious cases.

The accumulation of CO2 produced by respiration will lead to anaerobic respiration of grain heap, and produce intermediate metabolites such as alcohol, which will reduce or lose the vitality of grain and oil, and the final quality will decline. For example, sealed storage of high-moisture grain.

1 Vital activities

①、The breathing of grain

There are two types of respiration: aerobic respiration and anaerobic respiration

Influencing factors: seed state of embryo and grain specific maturity integrity, temperature, water content, gas composition, etc

1 Vital activities

②、After-ripening

During the post-ripening period, because of vigorous physiological activities and strong respiration, food will release a lot of water vapor and heat, and form water droplets that condense on the surface of grains after encountering cold air, so that grains "sweat". At this time, if not timely ventilation to reduce humidity and cool down, it is easy to make grain fever or mildew.

In order to promote post-ripening of grain and improve grain quality, new grain should be dried as far as possible before storage, and good ventilation conditions should be maintained after storage.

1 Vital activities

③、Ageing

The phenomenon of grain from new to old, from vigorous to aging is called grain aging. Grain aging is the natural deterioration of grain, the result of physiological and biochemical changes, and is a kind of invisible loss.

Grain with and without embryos will age.

The factor that determines grain aging is storage time, aging appears with the extension of storage time, and gradually deepens with the extension of storage time.

1 Vital activities

④、Effect of germination

Germination conditions: **enough moisture appropriate temperature adequate oxygen, germination three elements lack any elements can not germinate, among which water is the primary condition for seed germination seed germination, generally to absorb 25% 50% or more of its own quality of water.**

Germination control: **According to the three elements of seed germination, measures should be taken to control one or two of them, so that the seeds are in dormancy. For example, water control is generally adopted to control germination, and low temperature and low oxygen can also be adopted to keep the grain and oil with high water content that cannot be aired in time.**

2 Rats

Australia's trillions of tonnes of unmarketable grain have bred rat infestments. In addition to being large, 40 percent of the mice had the virus. The rats have destroyed crops such as wheat and rapeseed and eaten animal feed, causing untold economic losses to local farmers and grain buyers.

According to *the Financial Times*, the plague outbreak in Australia has cost the agricultural sector at least 1 billion Australian dollars.

3 Insects

In recent years, crop diseases and insect pests are reoccurring due to climatic conditions and invasion of foreign insect sources. The post-production loss of grain in China is about 10%, of which 5% is caused by pests. According to *the FOOD and Agriculture Organization* of the United Nations, the global food loss caused by pests is 4 to 6 percent.

According to expert estimates:

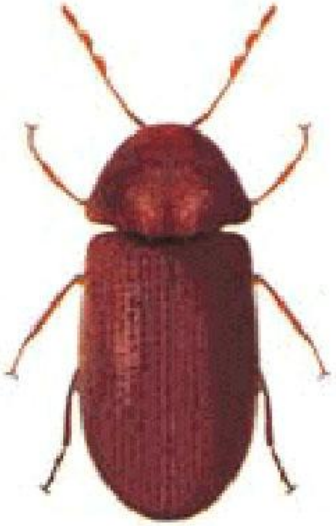
- **There are more than 1600 kinds of diseases, insects, grasses and rodents in Chinese crops.**
- **Which can cause serious harm to more than 100 kinds;**
- **Pests and diseases cause 14 million tons of food to be lost each year.**

cornweevil

rice weevil

Quasi-Akaya Thief

Valley beetle



Saw Valley Thief

4 Grain storage microorganism

Source: field (primary) storage (secondary)

Species: Aspergillus and penicillium were the main species, followed by Mucor and rhizopus.

Process: There are three stages——Early metamorphic mildew and mildew

	aspergillus restrictus	Aspergillus glaucus	aspergillus albicans	Aspergillus palm	Aspergillus flavus
Corn＆wheat	13.5~14.5	14.0~14.5	15.0~15.5	15.0~15.6	18.0~18.5
broomcorn	14.0~14.5	14.5~15.0	16.0~16.5	16.0~16.5	19.0~19.5
soybean	12.0~12.5	12.5~13.0	14.5~15.0	14.5~15.0	17.0~17.5

4 Grain storage microorganism——Type of mildew

Poor quality leads to mildew:

Poor grain quality, high moisture, high impurities, low integrity, low maturity, low seed disease rate.

Dew leads to mildew:

Caused by temperature condensation.

4 Grain storage microorganism——Type of mildew

Moisture absorption leads to mildew:

Dry food caused by moisture absorption, such as wall and ground moisture intrusion into dry and wet food mixed storage.

Water immersion leads to mildew:

Caused by water infiltration, rain leakage and dew dripping from the top of the warehouse.

3 Fungus

Food is also rich in carbohydrates, protein, fat and inorganic salts and other nutrients, is the natural culture medium of microorganisms. They are attached to the surface and interior of food and its products, in the appropriate conditions of the chemical environment, the decomposition of organic material in food, make it produce discoloration, taste, fever, mildew and other symptoms.

These microorganisms can not only cause mildew but also produce toxic and carcinogenic toxins.

4 Heavy metal

According to research data, there are nearly 20 million hm^2 of arable land in China suffering from cadmium pollution to varying degrees, accounting for about 1/6 of the total arable land.

The main sources of heavy metal pollution are:

- **Tailings formed by mining, waste gas and waste water generated in the smelting process, with rain, sewage into the water or soil;**
- **Industrial sewage and domestic sewage enter farmland. For example, in places with developed electroplating industry, irrigation water is polluted by wastewater, which is easy to cause heavy metal pollution in farmland soil;**
- **the use of high heavy metal content of fertilizer, improper use of some heavy metal containing pesticides, veterinary drugs and additives;**
- **Some heavy metals in industrial waste gas and automobile exhaust gas enter soil with air deposition, leading to heavy metal pollution in soil. According to some reports in Britain, 50% of the cadmium pollution in farmland soil in Britain comes from atmospheric deposition.**

3.1.3 Overprocessing

China loses more than 7.5 million tons of grain every year due to excessive processing, according to a notice on strengthening grain loss reduction issued by the former Ministry of Agriculture in 2014.

Typically, 50 kg of husked rice turns into about 40 kg of edible brown rice, which loses another 5 kg when ground to white rice, and another 2 kg after two rounds of polishing and screening, making a total of about 7 kg of edible rice lost.

3.1.4 Consumption link

① Due to the influence of traditional marriage and funeral customs, culture and other factors, the waste of all kinds of banquets is serious;

② There is also waste in collective canteens, individuals and families.