Structural Design and Innovation of Gordon Euryale Shell from the Perspective of Agricultural Mechanization

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Abstract: With the acceleration of agricultural mechanization, the technical innovation of Gordon euryale shell machine has become the key to improve the efficiency of Gordon euryale industry. This paper comprehensively analyzes the development trend of agricultural mechanization, especially the driving effect on the demand of Gordon seed shell remover. As an important tool connecting agricultural production and market, the structural design and innovation direction of Gordon euryale seed deshell machine directly affect the development and upgrading of Gordon euryale seed industry. This paper summarizes the current state of agricultural mechanization, analyzes the unique decapping requirements of the industry and the relationship between the two, then details the key points of design innovation, including innovation opportunities brought by technological progress and function expansion and diversification strategies. It also discusses the potential impact of the machine on agricultural production mode and industrial chain, and points out the development trends and challenges.

1. Introduction

The promotion of agricultural mechanization is an important symbol of the development of modern agriculture, and as an important aquatic crop, Gordon euryale seed is more important in the Chinese traditional agriculture. The shell process in the industrial production of Gordon euryale is related to the quality and yield of the final product.

2. Development trend of agricultural mechanization and demand analysis of Gordon euryale shell removal machine

2.1 Overview of agricultural mechanization

Agricultural mechanization does not simply refer to the use of more mechanical equipment, but involves the optimization and innovation of a comprehensive system, including planting, harvesting, processing and other stages. This not only means the diversification and specialization of the functions of mechanical equipment, but also includes the redesign of agricultural operation processes and the intelligent upgrading of agricultural production mode. By reducing the labor cost, improving the accuracy of operation, mechanization continuously promotes the development of

agriculture to scale and intensification, and fundamentally improves the conditions and effects of agricultural production.

At the same time, agricultural mechanization in promoting innovation technology application, to adapt to the environmental change, enhance the ability of agricultural sustainable development is critical, such as precision agriculture practice based on advanced mechanization equipment, through the fine management of crop growth conditions, realize the optimal allocation of resources, reduce waste, protect the ecological environment. And with the increasing challenges brought by global climate change to agricultural production, the flexible application and continuous innovation of agricultural mechanization technology have become one of the effective means to adapt to and mitigate the impact of climate change. In this context, the development of agricultural mechanization is not only related to the improvement of production efficiency and economic benefits, but also related to the overall consideration of food safety, ecological balance and future sustainable development.

2.2 Gordon euryale industry and shell demand

As a kind of crop with both medicinal value and food nutrition effect of Gordon euryale seed, the shell is hard and difficult to digest, which hinders the nutrient absorption of human body, and the demand for shelled shell is increasingly prominent. The traditional manual shell method has high labor intensity and low efficiency, and has been unable to meet the requirements of industrial development for output and efficiency. Agricultural mechanization can introduce Gordon euryale shell removal machine into the production line to improve production efficiency, optimize output quality and form market demand.

The need of the industry for the shell removal machine is not only the improvement of yield and efficiency, but more importantly, the separation of the shell and the seed needs to achieve extremely high accuracy to ensure that its nutrients can be preserved in the seeds to the maximum extent. This puts forward higher requirements for the accuracy, stability and the protection of raw materials involved in the design of the Gordon euryale shell removal machine[1]. At the same time, the Gordon euryale shell machine should be suitable for different scales of farmers and agricultural enterprises, and can be flexibly configured in the production process under different environments, which can not only meet the needs of large-scale manufacturing, but also adapt to the requirements of small-scale production and local characteristic production.

2.3 The relationship between agricultural mechanization and Gordon euryale shell

In the context of the development of modern agriculture, mechanization has become the main way to improve efficiency and reduce labor intensity. However, as an agricultural product with multiple uses, Gordon euryale has large demand in the market and considerable profits. However, its traditional processing method mainly relies on manual operation, with high labor intensity and low efficiency. In the process of mechanization, the development of Gordon euryale into the shell machine, which is not only the embodiment of technological progress, but also an effective reform of the traditional agricultural model.

At the same time, with the continuous progress of technology, especially the application of intelligent technology such as Internet of things, big data, Gordon euryale to shell machine not only can improve the shell speed and accuracy, more can through the data analysis of the shell quality real-time monitoring and adjustment, to maximize the integrity of the Gordon euryale seed and nutritional value. This monitoring not only improves the production efficiency, but also is the standard equipment to ensure the high quality of the products, making the deep processing and all-round utilization of Gordon euryale seeds possible[2]. In addition, the development of Gordon

euryale shell machine can also drive the innovation of related support technologies and equipment, such as automatic control system and fine classification device. The benign interaction and technology integration of these technologies will greatly promote the development of agricultural mechanization to the depth and breadth.

3. Structural design and innovation direction of Gordon euryale shell eller

3.1 Overview of existing Gordon euryale shell structure

The existing structure of the Gordon euryale shell machine (Figure 1) can be roughly summarized as the three main links: the feeding equipment, core separation device and the discharging equipment. The feeding equipment is responsible for continuously and stably sending the Gordon euryale seed to be shelled to the next link according to a certain frequency and quantity, and the common form is the vibration feeding device or rotating screw feeding device. The shell separation device depends on the set parameters, such as the elastic adaptation coefficient and string length ratio, and the discharging equipment ensures the smooth removal and storage of the Gordon euryale seed after removal.

The design principle of Gordon euryale shell removal machine is relatively simple, but the knowledge of mechanics, fluid science and other fields contained in it gives it a high space for innovation. Among them, the putamen separation device has been continuously optimized and updated. For example, the combination of airflow suspension and injection can enhance the stripping effect between the Gordon euryale seed and the shell and improve the efficiency of decapping. At the same time, the feeding equipment is also developing in the direction of automation and precise control. For example, the intelligent sensors monitor the quantity and speed of the seeds to be processed in real time, and then adjust the frequency and quantity of the euryale through data feedback and processing, so as to reduce the difficulty of work and improve the production efficiency. In addition, it can develop high-performance discharging equipment to strengthen its corrosion resistance and oxidation resistance in high humidity environment, which is also an innovation point of the current Gordon euryale shell machine.
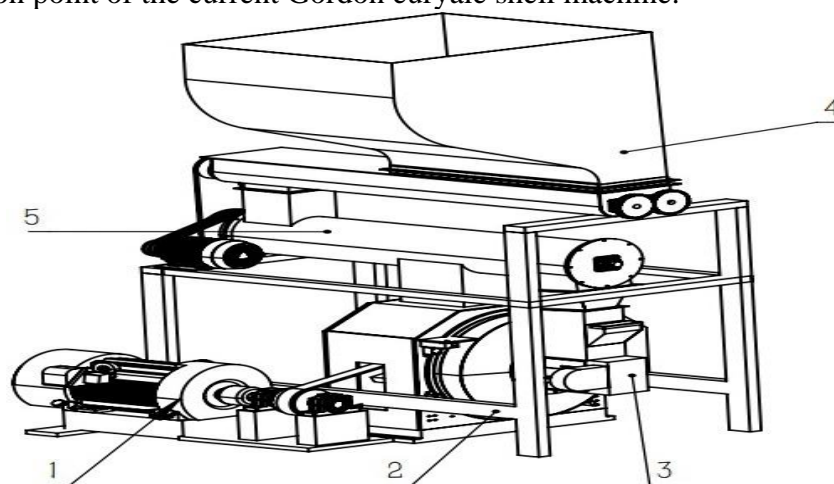

Figure 1: Structure diagram of euryale shell eller

3.2 Key points of structural design innovation

In the structural design innovation of the shell machine, the micro sensor can be fused into the separation device, in which the size, hardness and maturity of each seed can be measured in real

time. Using these data, the mechanical device can dynamically adjust the strength of the Gordon euryale seed, thus optimizing the decapping process and significantly reducing unnecessary damage. At the same time, an intelligent algorithm is introduced to manage the processing process, and the operating parameters, such as shell removal speed and shell removal strength, are adjusted according to the real-time feedback, which not only improves the efficiency of shell removal, but also ensures the mild treatment of the Gordon euryale seeds.

And innovation is embodied in the Gordon euryale shell on the overall design ideas, adopts the modular and scalable design principles, which makes the equipment can quickly adjust or upgrade according to the specific job requirements, for example by changing different functional modules, make the same equipment can complete shell work, also can adapt to the subsequent cleaning, drying and even sorting process. This flexibility greatly improves the use efficiency and economic value of mechanical equipment[3]. We also need to pay attention to the environmental adaptability design to ensure that the equipment can maintain high efficiency and stability under different humidity and temperature conditions, and further solve the potential problems caused by environmental changes.

3.3 Innovation opportunities brought about by technological progress

Under the guidance of agricultural science and technology, the foundation of the structure design of Gordon euryale shell machine includes cloud computing and fine sensing technology. As a part of the processor, cloud computing provides strong data storage capacity and processing speed, and promotes the management, analysis and application of real-time and massive data. In the process of shell removal, by collecting real-time data, we can quickly identify multiple parameters such as size, hardness, physical properties, ambient temperature and humidity of the euryale seed, supplemented by agile calculation, so that the machine can dynamically adjust the operation parameters and improve the efficiency of shell removal. At the same time, through the analysis of more detailed data, such as the original planting area, harvest time, type and growth status and other information, with the prediction algorithm, the adaptability of Gordon euryale shell work, both output quality and efficiency, can be improved to a new level[4]. In addition, the accumulation of these accurate data provides a strong guiding role for reducing the production cost, optimizing the resource allocation, and predicting the future output in the later stage, and further establishes the trend of on-demand and real-time production.

At the application level of fine sensing technology, advanced sensors realize flexible mechanical response by collecting data of various subtle changes in the process of shell removal. For example, for euryale with different hardness, it can automatically adjust the shell strength to maintain the lowest damage rate. Even by analyzing the detailed data collected by the sensor, the shell is expected to achieve self-repair and self-optimization, reducing maintenance costs.

3.4 Function expansion and diversification

In the process of agricultural mechanization, the function expansion and diversification of seeds are shown in intelligent application and diversified service, Through the combination of AI technology, breaking the traditional mode, such as cloud data management, has the strong ability to identify seeds and impurities, classification and counting, and self-optimization parameters; it has high operational value in modern agricultural production. At the same time, the application of intelligent diagnosis system can also find and troubleshoot faults in time, which greatly improves the use efficiency of the equipment. Predictive maintenance strategy can evaluate and predict the equipment condition before difficult problems arise to avoid potential downtimes and avoid the impact of hardware replacement or repair[5]. If the Internet of Things technology is used to connect

the Gordon euryale shell to the network, the stable operation and rapid maintenance will be realized under real conditions, and the truth will greatly improve the product efficiency and reduce the use cost.

The diversified services focus on meeting the special needs of different user groups. The Gordon euryale shell machine not only needs to meet the basic decapping needs, but also needs to effectively classify and combine various functions to adapt to different types of Gordon euryale and the processing needs of different situations. We need to implement precise operations based on different parameters such as raw material type, size, shape, hardness, etc. And we make personalized function expansion for specific needs. From the perspective of service mode, it is necessary to better serve agricultural producers and consumers in terms of chirality, operation convenience and emergency handling ability.

For example, Table 1 is the structural design and innovation direction of Gordon euryale shell eller.

Table 1: Structural design and innovation direction of Gordon euryale shell eller

	Status quo or problem	Innovative orientation
(I) Overview of the structure of the existing Gordon euryale shell remover	Fixed shell drum and rolling systems Operation and maintenance are relatively complex The energy consumption is relatively high Processing efficiency is not suboptimal	Study new unapping ideas Improve the structural efficiency and robustness Optimize the operation and maintenance processes Introduce energy saving technology
(2) Key points of structural design innovation	Operation: Make it easier for users to operate Efficiency: improve processing efficiency Reliability: to reduce mechanical failure	Simplified operation interface design, such as the application of automation elements Improve the energy utilization rate and the material conversion rate Use new materials to improve equipment life and reliability
(3) Innovation opportunities brought about by technological progress	Using new materials or derivative techniques Optimization design using big data analysis Develop intelligent and automated operations	Adjust the equipment structure design according to new materials or technology and apply artificial intelligence to enhance the self-diagnosis and troubleshooting ability of the equipment Realize the remote monitoring and independent decision-making of the equipment
(4) Function expansion and diversification	A single decapping function Unable to adapt to the decoating of different varieties of Gordon euryale seeds	Research and development with multi-functional modules design, such as cleaning, grading, etc According to the characteristics of different varieties of Gordon euryale shell, the module design can be quickly switched

4. Application prospect and industrial influence of Gordon euryale shell eller

4.1 Changes in agricultural production mode

In traditional agriculture, the processing of Gordon euryale seeds often relies on manual or original mechanical technology, with low efficiency and high cost. However, with the introduction of fine mechanization technology, especially the wide application of shell machine, the agricultural production mode appeared a qualitative leap, this device not only improve the processing speed, more by reduce the error rate, ensure the consistency of the Gordon euryale seed quality and security, such as intelligent control system can continuously monitor and adjust the parameters in the process of shell, so as to adapt to different size and hardness of Gordon euryale seed, the improvement of technical accuracy significantly enhance the stability of the yield.

At the same time, in the traditional agricultural production, the input of a large amount of labor force is not only inefficient, but also has the problem of resource waste. The promotion of mechanized production effectively concentrates the production resources, reduces the dispersed consumption of labor force, and realizes the optimal management of the production process. In addition, the machine also encourages agricultural producers to change their ideas from passive production operators to active technology users and innovators. This ideological change not only helps to improve the economic benefits of individual farms, but also promotes the progress of agricultural science and technology and the development of rural economy in a larger scope.

4.2 Influence on the Gordon euryale industrial chain

For farmers, the Gordon euryale shell remover integrates the complex processes such as harvesting, cleaning and shell breaking, which greatly reduces the operation difficulty and time cost. Its efficient processing performance simplifies the activities that originally cost a lot of labor and energy, and promotes the scale growth of productivity. At the same time, by reducing manual contact, the lower pollution risk makes the quality of production more guaranteed to meet the market's growing demand for healthy and safe food.

In the subsequent processing links of the Gordon euryale industry chain, the stable quality and abundant quantity of raw materials brought by the Gordon euryale shell machine provide a reliable guarantee for processing enterprises, from which more innovation possibilities are derived. For example, the extraction of medicinal ingredients in Gordon euryale seed or the development of new food, to provide consumers with a broader space for product selection, and the improved equipment makes the manufacturing process more transparent, to promote the development of the whole industry to the sustainable direction of injecting power.

4.3 Development Trends and Challenges

As agricultural mechanization to the direction of intelligent, precision, Gordon euryale to shell machine is facing continuous technology upgrade requirements, the introduction of intelligent technology can improve the operation efficiency of equipment and shell quality, through machine learning and image recognition technology, accurate judgment Gordon euryale real maturity, personalized to shell, to reduce the waste of resources, and improve the consistency of the product. And with the enhancement of resource depletion and environmental awareness, the equipment design pays more attention to the reduction of energy consumption and material recycling, such as the use of energy-saving drive system and recyclable materials, in order to achieve the goal of sustainable production.

At the same time, the innovation and upgrading of Gordon euryale shell machine also faces

challenges. The innovation of technology and materials often requires huge investment in research and development, which is a considerable financial pressure for many small and medium-sized enterprises. The market acceptance of new technologies and the adaptation to the regulatory environment cannot be ignored, such as intelligent equipment may involve data security and privacy protection; environmental design must comply with increasingly stringent international standards and regulatory requirements.

5. Conclusion

To sum up, as a concrete practice field of agricultural mechanization, the structural design and technical innovation of Gordon euryale shell machine not only reflects the deepening of the mechanization process, but also indicates the transformation of the production mode of Gordon euryale industry. Through the analysis in the paper, it can be seen that Gordon euryale shell machine is extremely important in enhancing industrial efficiency, promoting the upgrading of agricultural production mode, and having an overall impact on the industrial chain. In the face of new opportunities brought by future technological progress, we should also take the accompanying challenges seriously, and need continuous exploration and breakthrough, and continuous innovation, so as to contribute to the development of agricultural mechanization.

Acknowledgement

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