RESEARCH STATUS OF MECHANIZED PRODUCTION TECHNOLOGY AND EQUIPMENT OF BUCKWHEAT IN CHINA
/
中国荞麦机械化生产技术与装备研究现状

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ABSTRACT
In view of the low level of mechanized sowing and harvesting technology of buckwheat, the operation quality of mechanized production equipment needs to be improved, which cannot adapt to the production practice of the rapid development of buckwheat industry at this stage in China. This paper summarized the scale of buckwheat production in the world in recent years. The main planting provinces and yields of buckwheat in China were analyzed. The problems of mechanized sowing and harvesting of buckwheat in China were analyzed. The typical machines used in production at present and their characteristics were described. It is pointed out that the future research on buckwheat seeding technology and equipment should focus on precision seeding technology, trencher anti-blocking technology, key technology of plot breeding seeder, intelligent monitoring system. At the same time, it also pointed out that the mechanized harvesting technology and equipment of buckwheat should focus on the research of agricultural machinery and agronomy integration technology, hilly and mountainous harvesting technology, community harvesting technology, harvesting operation technical specifications and quality standards. The summary of mechanized seeding and harvesting technology of buckwheat at the present stage is expected to provide reference for the development of China's buckwheat industry.

摘 要
针对中国荞麦机械化播种和收获技术水平不高，机械化生产装备作业质量有待提高，不能适应现阶段荞麦产业快速发展的生产实际。文章综述了世界近年来荞麦生产规模，分析了荞麦在中国的主要种植省份和产量情况，分析了中国荞麦机械化播种和收获技术存在的问题，阐述了目前生产上使用的典型机具及机具特点，指出了荞麦播种技术与装备未来应重点研究精量播种技术、开沟器防堵技术、小区播种关键技术、智能监控系统等，荞麦机械化收获技术与装备应重点研究农机农艺融合技术、丘陵山区收获技术、小区收获技术、收获作业技术规范和质量标准制定等。通过对现阶段荞麦机械化播种和收获技术的总结，以期为中国荞麦产业的发展提供参考。

INTRODUCTION
Buckwheat is an annual or perennial herb of the genus Fagopyrum of Polygonaceae *(Tang Y., et al, 2019; Zhang Y.Z., et al, 2004)*. Buckwheat is a crop for both medicine and food, which has the functions of food, medicine, health care, feeding and so on *(Ding M.Q., et al, 2018)*. Buckwheat has the functions of anti-oxidation, prevention and treatment of anemia, anti-cancer, regulation of immunity, prevention of a variety of chronic diseases and so on *(Shen L.Z., et al, 2021; Yang J., et al,2019; Li L.K.,2018)*. It originated in China, its origin center being located in southwest China. It has a long history of cultivation in China *(Shi J.Q., et al, 2015; Fan Y., et al,2019)*. Buckwheat is also rich in cultivated varieties and wild species resources in China, including *Fagopyrum esculentum moench* and *Fagopyrum tataricum (Ren K., et al, 2021; Dong X.N., et al, 2017).* It has a short growth cycle, only 70-90 days, and early-maturing varieties can be harvested in more than 50 days. It has the advantages of strong adaptability and barren tolerance *(Qi Y.J., et al, 2020)*. It is of great significance in stabilizing grain income in mountainous and dry land, crop rotation, soil fertilization and regulating people's diet structure. Because the topography of the area where it grows is mainly mountain or sloping land, it is very difficult for large-scale modern operating machines and tools to work.

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As a result, the mechanized production level of buckwheat is not high, which affects the development of buckwheat industry. However, buckwheat, as a unique crop, has played a special role in developing characteristic agriculture, regional agriculture and helping farmers in poor areas get rid of poverty and become rich. Therefore, it is of great significance to analyze and study the current situation of buckwheat mechanization technology in China. In view of the fact that the production link of buckwheat mainly includes sowing and harvesting, this paper will analyze and explain the mechanized sowing and harvesting technology of buckwheat.

Production scale of buckwheat in the world and in China

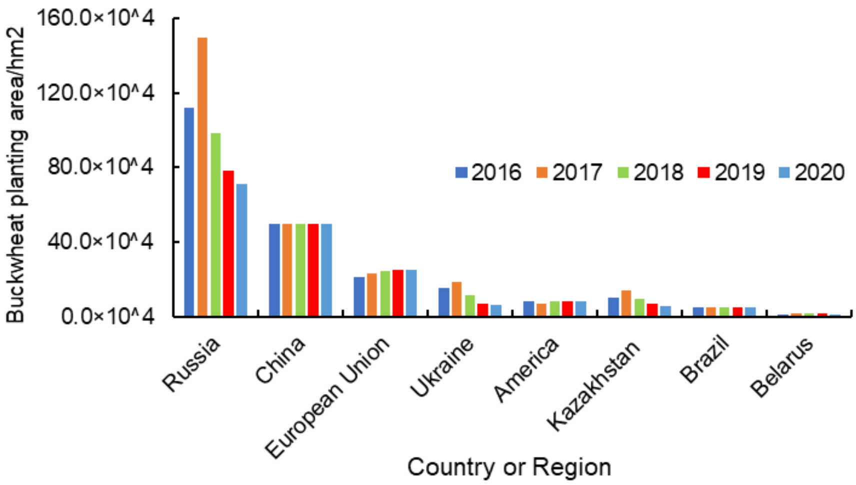

Fig. 1 - 2016-2020 buckwheat planting area in different countries or regions in the world

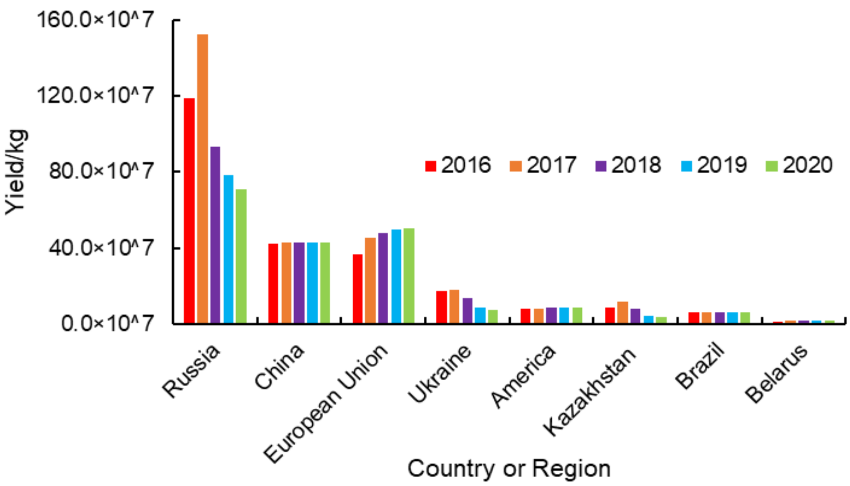

Fig. 2 - 2016-2020 buckwheat yield in different countries or regions in the world

According to the data of Euromonitor International Ltd 2021, the main planting countries of buckwheat in the world include Russia, China, the European Union, Ukraine, etc. Among them, the country with the largest planting area and yield is Russia. In recent five years, the average planting area is 1.02×10^6 hm^2 and the yield is 1.03×10^9 kg.

Buckwheat is mainly distributed in hilly and mountainous areas and high altitude areas, and the main producing provinces include Yunnan, Inner Mongolia, Sichuan, Gansu, Shanxi, Shaanxi, Guizhou and other places. Among them, Yunnan Province has the largest planting area and output. The geographical distribution of *Fagopyrum esculentum moench* and *Fagopyrum tataricum* is quite different. *Fagopyrum esculentum moench* is mainly distributed in northern China, mainly in Inner Mongolia, Shaanxi, Shanxi, Gansu, Ningxia and other places. *Fagopyrum tataricum* is mainly distributed in southern China, mainly in Yunnan, Guizhou and Sichuan, etc. In the past four years, the average planting area and yield in Yunnan were 1.23×10^5 hm^2 and 1.90×10^8 kg, respectively. The average planting area and yield in China in the past four years were 6.18×10^5 hm^2 and 8.74×10^8 kg, respectively *(Hu X.Z., et al, 2021)*.

Figure 3 shows the distribution of buckwheat planting area in different provinces from 2017 to 2020. Figure 4 shows the distribution of buckwheat yield in different provinces from 2017 to 2020.

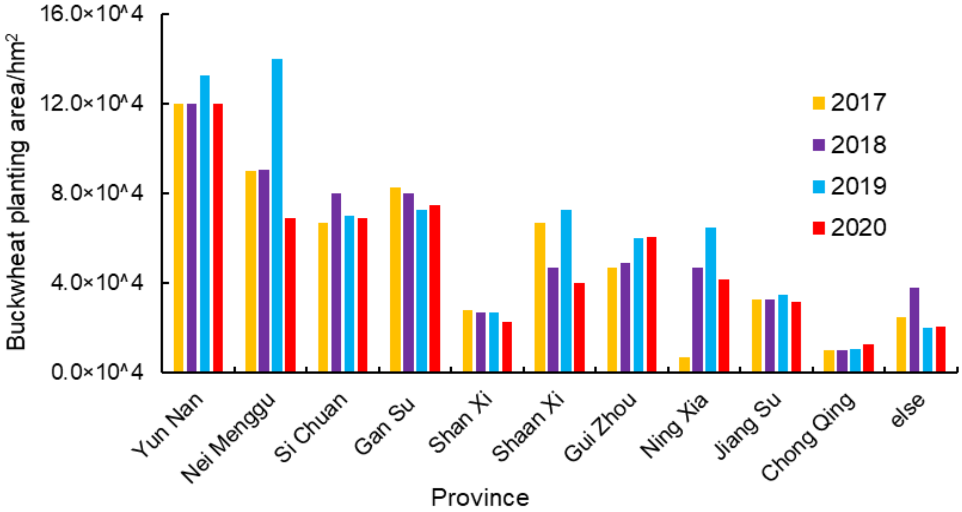

Fig. 3 - Distribution of buckwheat planting area in different provinces of China from 2017 to 2020

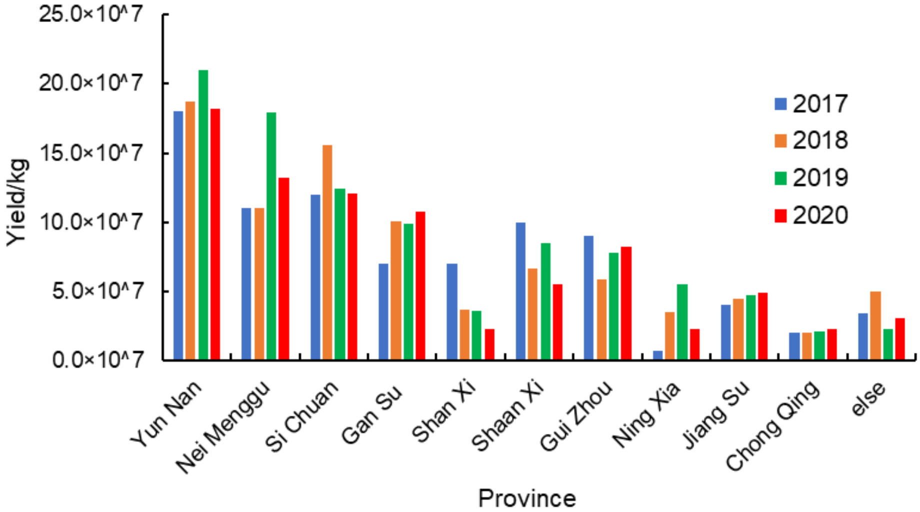

Fig. 4 – Distribution of Buckwheat yield in different provinces of China from 2017 to 2020

Mechanized seeding technology and equipment of buckwheat

Due to the different planting areas of buckwheat, the mechanized sowing level of buckwheat varies greatly in China. The sowing machine is mainly used for strip sowing and hole sowing in the plain land. In the hilly and mountainous areas, "manual sowing + rotary ploughing" or suspended strip planter are often used to sow. The main problems are: (1) the consistency of sowing depth of the traditional sowing operation is poor, and the seedling emergence effect is not good; (2) the single group profiling performance of the seeder is poor, and some even do not have profiling mechanism, which is easy to cause inconsistent sowing depth.

A buckwheat planter with two rows in one big ridge (figure 5a) was developed by Bu Yi team *(Bu Y., et al, 2016)*. The machine used strip sowing. The ridge spacing was 45~50 cm. The row spacing was about 25 cm. The working width was 1.35 m to 1.5 m. At present, it has been popularized in Yunnan, Shanxi, Jiangsu, Ningxia, Gansu and other provinces, and achieved good results in production. Ding Xiaoyi et al adopted the 2BFS-7 modified strip sowing machine to realize the mechanized fertilization, sowing and soil mulching of buckwheat. The results showed that compared with the conventional open field artificial fertilizer sowing technology, the yield of buckwheat mechanized sowing technology was increased *(Ding X.Y., 2013)*. Cheng Yuming designed a 2B-04A2 buckwheat hill-seeder (figure 5b). The machine adopted spoon wheel type seed metering device, and the burrowing device adopted duck bill type burrowing device. The depth of sowing was 30 ±10 mm. The row distance was 380 ±20 mm. The number of seeds per hole was 3~5. The distance between holes was 160~180 mm.

The field test results of the prototype showed that when the rotational speed was 40 r/min, the qualified rates of hole sowing, seedling emergence, hole, sowing depth, hole spacing and row spacing were 90%, 86%, 0%, 85%, 100% and 100% respectively *(Cheng Y.M., 2021).* Yang Li designed a buckwheat sowing and fertilizing machine integrated with ditching, sowing, fertilization, soil mulching and other operations (figure 5c). The micro-tiller was used to drive the seeder to realize the mechanized sowing of buckwheat in hilly and mountainous areas. The machine adopted strip sowing. The line spacing was 31-41 cm. The distance between plants was 2.1-2.6 cm *(Yang L., 2020)*. Liu Lijing's team designed a suspended buckwheat fertilization seeder (figure 5d). The machine adopts horizontal disc seed metering device, which can complete fertilization and sowing operation at one time. The ridge width was 30~50 cm and the row spacing was 15~35 cm, which could realize precision sowing. Aiming at the problem of inorganic availability of buckwheat sowing in small plots in hilly and mountainous areas, the team also developed a buckwheat seeder in hilly and mountainous areas (figure 5e), which was powered by a walking tractor and could complete 2 or 4 rows of buckwheat sowing at a time.

(a) (b) (c) (d) (e)

Fig. 5 - Buckwheat seeder

The seed metering device is the core component of the seeder. Chinese scholars had studied and explored the seed metering device of buckwheat. In view of the lack of buckwheat seed metering device and the bar breaking phenomenon of traditional seed metering device at high speed, Ru Mengfei *et al* studied a new type of seed metering device and optimized its performance to solve the strip breaking phenomenon of traditional seed metering device in high speed operation. And it can realize the double-row sowing of one device, which is beneficial to the grouping of the seed metering device and reduces the sowing unit *(Ru M.F. et al, 2020a; Ru M.F. et al, 2020b)*. Li Mingsheng *et al.* simulated the seed metering device of buckwheat planter based on discrete element method. The effects of different rotational speed, groove radius and slot number on the discharge of seed metering device were studied by orthogonal experiment. The results show that the relative error of displacement between the test and the simulation test is 2.93% to 9.90%. The discharge of buckwheat seed metering device increased with the increase of groove wheel speed, and the overall linear correlation coefficient $R^2 > 0.98$ *(Li M.S., et al, 2019)*. In order to realize the quantitative sowing of buckwheat, Ye Shaobo *et al* designed a kind of air chamber rotary precision seed metering device. The bench test showed that the precision seed metering effect of buckwheat was better under the combination of negative pressure value 2.4 kPa of seed metering device air chamber 2.0 mm and rotational speed 25 r/min of seed metering plate. The qualified index of precision seeding per grain is 88.32%, the replay index is 7.35%, and the missing seeding index is 4.33% *(Ye S.B., et al, 2021)*. The physical characteristics of buckwheat seeds are an important basis for the design of seed metering device, and also an important factor affecting the sowing performance. In view of the lack of seeds contact parameters that can be used as a reference for the design of key mechanical components such as buckwheat planting, harvesting, and processing, Xu Bing et al combined simulation optimization design experiments and physical experiments to calibrate the parameters of simulated discrete element of buckwheat seeds (*Xu B. et al, 2021)*.

Buckwheat mechanized harvesting technology and equipment

Buckwheat is a small crop. Compared with the main food crops in China, the planting area of major food crops is small, the overall attention is not enough, and the overall mechanized harvest level is not high. Because of its unique mechanized harvesting characteristics, it has brought serious challenges for buckwheat mechanized harvesting operation. Buckwheat belongs to infinite inflorescence plant, which can bear fruit while blooming. The same plant phenomenon of grain and flower will also occur in the mature stage. The moisture content of stems and leaves in the harvesting period is high, which affects the harvesting of buckwheat. For mature buckwheat, the connecting force between grain and stem is very small, and it is easy to fall off, which will result in great loss of natural grain drop during harvest.

In addition, the toughness of buckwheat stem is poor, mechanical threshing is easy to cause broken stem, mixed with grains, and difficult to separate.

The technical level of mechanical flower harvesting of buckwheat is quite different in China. There are three harvesting methods: combined harvesting, two-stage harvesting and stage-by-stage harvesting, and the three long-term harvesting methods coexist. The level of mechanized harvesting and the choice of harvesting method are generally related to topography, regional economic development level, land circulation scale and harvesting time and other factors *(Lu Q., et al, 2020).* The combined harvesting of buckwheat is to complete the operation links such as cutting, threshing, separation and cleaning at one time to get clean seeds. Wheat or rice combine harvester is often used for operation, which has high operation efficiency and grabs agricultural time, but the harvest quality needs to be improved. At the 2016 demonstration meeting of mechanized buckwheat harvesting in Dingbian, Shaanxi Province, buckwheat was harvested directly with a rice-wheat combine harvester. The highest harvesting loss rate was 33.7%, and the harvesting effect was not good *(Hang X.N., et al, 2018)*. In order to improve the quality of buckwheat combined harvesting, Chinese scholars have studied the mechanical harvesting characteristics of buckwheat, high efficiency and low damage cutting table and threshing and cleaning device of combined harvester.

In the study of mechanical harvesting characteristics, Li Jincai *et al* studied the physical properties of some sweet buckwheat and bitter buckwheat grains *(Li J.C., et al, 2017)*. Sun Jingxin *et al* studied the conventional mechanical properties of superior buckwheat grains and the viscoelastic properties of core powder, and analyzed the related factors *(Sun J.X., et al, 2018)*. Zhang Yanqing *et al* studied the biological morphology, basic biomechanics and dynamic cutting mechanics of buckwheat and oat crops *(Zhang Y.Q., 2019)*. Huang Xiaona *et al* studied the effects of moisture content, loading rate, loading direction and buckwheat varieties on the compression and shear properties of buckwheat grains *(Huang X.N., 2020)*. Qiu Shujin *et al* studied the friction mechanical properties of buckwheat grain group *(Qiu S.J, et al, 2021)*. The above basic research is expected to provide reference for the development of buckwheat mechanized harvesting and processing equipment, parameter optimization and the selection of suitable harvesting time.

Fig. 6 - 4LZQ-1.5 crawler buckwheat combine harvester

In the aspect of structural device research, Zhao Jingtao designed a grazing device composed of four-bar mechanism in view of the serious loss of the harvester of the existing combine harvester. He installed a belt conveying device on the cutting table to increase the plate area on both sides of the cutting table and reduce the phenomenon of hanging ears and grain tipping caused by the small side plate area of the traditional cutting table, to reduce the loss of the cutting table *(Zhao J.T., 2019)*. In order to solve the problem that the existing grain combined harvesting equipment is difficult to adapt to the harvest characteristics of buckwheat, Yi Meng *et al* developed a buckwheat harvesting test-bed before harvesting *(Yi M., et al, 2021)*. An experimental study was carried out with feeding speed, inlet air pressure and drum speed as influencing factors, harvesting rate and spatter loss rate as evaluation indexes. Zhang Jian *et al* designed a nail tooth type buckwheat threshing device and carried out finite element analysis *(Zhang J., et al, 2019)*. Zheng Decong's team has successively developed a centrifugal threshing device *(Wang J.W., et al, 2019)*, a rotary threshing device with internal and external drum (*Wang J.W., et al, 2020a*), a multi-stage tangential drum threshing device *(Li A.B., 2019)*, and a hybrid threshing device with extendable rod tooth and rasp bar *(Wang*

X., et al, 2022), which are used in the special threshing device for buckwheat, and experiments have been carried out.

Based on the internal and external drum buckwheat separation device, Wang Jiawei designed a buckwheat threshing and cleaning performance test-bed. The overall situation of the extrudate, the content of each component in the stripped mixture and the axial cloth along the threshing drum were analyzed, and the buckwheat cleaning test was carried out, and the best cleaning performance parameters were obtained. On this basis, the 4LZQ-1.5 crawler buckwheat combine harvester (Fig.6) was designed, and the field performance test was carried out. Tested by a third party, the total loss rate was 4.2%, the impurity rate was 2.5%, and the grain damage rate was 2.6% *(Wang J.W., et al, 2020a; Wang J.W., et al, 2020b).*

In terms of cleaning, Hou Huaming *et al* designed a vertical air-blowing test device for the suspension speed of agricultural materials. The suspension speeds of grains, branches, stems and leaves of buckwheat were 4.47~10.18, 1.85~5.18, 2.80 ~ 8.37 and 0.76~2.99 m/s, respectively. At the same time, a kind of air-sieve cleaning device for miscellaneous grain crop extract was designed. The experimental results show that the optimal cleaning parameters of buckwheat extract are as follows: wind speed 5.85 m/s, wind direction 32.22°, amplitude 25.91 mm, frequency 186.38 r/min, the minimum cleaning loss rate is 5.79%, and the impurity content is 8.74% *(Hou H.M., et al, 2018)*. Zhang Longxiang mainly improved the efficiency of buckwheat cleaning from three aspects: exploring the structural improvement design, analyzing the movement state of buckwheat in the cleaning room and the flow field distribution in the cleaning room *(Zhang L.X., 2020)*. In order to solve the problem of high grain residue and impurity content in the threshing process of traditional closed cut-flow buckwheat threshing drum device, Wang Hao carried out the design and research of cleaning system *(Wang H., et al, 2021)*. Jing Yi studied the movement form and cleaning efficiency of buckwheat seeds at different positions on the sieve surface of the double-layer cleaning device *(Jing Y., 2019)*. In order to reduce the loss rate and impurity rate of buckwheat threshing material in the screening process and improve the screening performance of the vibrating screen, Fan Rong *et al* designed the planar square hole sieve, round hole sieve, non-planar convex-column sieve, pit sieve, and wave sieve. Screening test was conducted on buckwheat threshing material under different screen structure based on the discrete element method (DEM). The results showed that the screening effect of convex-column sieve was the best, followed by pit sieve, and they were better than the traditional planar sieve *(Fan R., et al, 2022)*.

When the buckwheat is harvested in two stages, the buckwheat is first cut down by a cutter-rower and laid on the ground in strips. After drying for a period of time, buckwheat seeds were harvested by a combine harvester with a picker. On the one hand, buckwheat grain can be fully utilized after ripening to increase buckwheat yield and harvesting quality. On the other hand, the moisture content of the stem can be reduced during harvesting, and the threshing and cleaning performance of the harvester can be improved.

Fig. 7 - 4LJQ-1.5 two-stage buckwheat picker combine harvester

In order to reduce and optimize the picking loss of two-stage mechanical pickup harvester, Wang Qiang designed a teeth belt buckwheat pickup test platform and carried out experimental research *(Wang Q., 2018)*. Huang Xiaona tested and studied the material characteristics of buckwheat, established the threshing model of cutting-transverse axial flow threshing system, and carried out simulation analysis and improved design. Based on the test and analysis methods such as bench test and high-speed photography, the operation performance of the improved cutting-transverse axial flow threshing system was analyzed and studied. *(Huang X.N., 2020)*. Dang Weilong designed a new plucking plate picking device and threshing device suitable for buckwheat picking and threshing, and built a buckwheat picking and threshing platform. On this platform, the effects of plucking plate picking device on buckwheat picking loss rate and threshing device on buckwheat threshing loss rate and threshing crushing rate were studied. The study showed that the pick-up loss rate was related to the pick-up speed, material transportation speed and inclination angle of the pick-up board, and the threshing loss rate and crushing rate were related to the feed quantity and drum speed *(Dang W.L., 2018)*. Zhang Kunkun worked out the final assembly configuration scheme of buckwheat picker by using virtual prototyping technology. A reasonable dynamics model of the whole machine layout was established and simulated *(Zhang K.K., 2019)*. The team integrated the development of 4LJQ-1.5 two-stage buckwheat picker combine harvester (Fig.7). Tested by a third party, the total loss rate was 3.5%, the impurity rate was 1.9%, and the grain damage rate was 1.4%.

In addition, in order to solve the problem of few machines and tools available for mechanized harvesting of buckwheat in small plots in hilly and mountainous areas, baking machines, buckwheat threshers or small harvesters are also used for sectional or joint harvesting in some areas. The main models and features are shown in Table 4. This kind of machine has the advantages of simple structure, small size, light weight, cheap price, poor harvesting effect on lodging buckwheat and high loss rate. However, compared with manual harvesting, it has high efficiency, time-saving and labor-saving, so they are still widely used.

Table 1

Typical buckwheat harvester

Machine model	Picture	Characteristics
4S series cutter-rower		The product has the advantages of small size, light weight, adjustable handle height, 180-degree rotation and easy operation. The walking gearbox adopts steering differential device for flexible rotation. The cutting table adopts the form of shaft transmission, which has the characteristics of large transmission torque, high safety factor, low failure rate and fast harvesting. The cutting width is 1 m, and the type of laying is lateral strip.
4G100 cutter-rower		The machine adopts hand-held self-walking system. The matching power is 6 hp. The reciprocating cutting device is adopted. The lowest stubble height is higher than 5 cm. The cutting width is 1 m. The type of placement is lateral bar placement. The productivity is 0.67-0.23 hm^2/h. The machine has flexible maneuverability, simple and convenient operation and is labor saving.
5TG-85 buckwheat thresher *(Lu Q., et al, 2022)*		The machine adopts rasp bar-nail tooth combined threshing device and air screen cleaning device, which can complete threshing and grain cleaning at one time. The results show that when the moisture content of buckwheat stem is 75%, the moisture content of grain is 17%, and the grass grain ratio is 4.4, when the rotating speed of the threshing drum of the thresher is 500 r/min, the threshing gap is 10 mm, the feeding amount is 0.8 kg/s, the air speed of suction mouth is 8 m/s, and the vibration frequency of vibrating screen is 25.12 $rad \cdot s^{-1}$. The crushing rate is 1.13%, the impurity content is 2.73%, the unthreshed loss rate is 0.07%, the entrainment loss rate is 1.77%, the cleaning loss rate is 1.96%, the spatter loss rate is 0.62% and the total loss rate is 4.42%.
4LZ-0.9LB series small harvester		The machine adopts self-walking crawler walking system and full-feeding harvesting mode. The whole machine power is 8.5 kW. The cutting width of the horizontal cutting table is 1 m. The feeding amount was 0.9 kg/s. The working speed is 0.4~0.7 m/s. The operating efficiency is 0.1-0.12 hm^2/h. The height of the stubble is adjustable, the ride design and comfort are high.
4LZ-0.6LA series small harvester		The machine adopts a hand-supported self-walking crawler system. The whole machine power is 6.5 kW. The vertical cutting table is adopted, and the cutting width is 0.9 m. Double-layer reciprocating cutting device is adopted. The feeding amount was 0.6 kg/s. The working speed is 0.5~0.9 m/s. The work efficiency is 0.04~0.067 hm^2/h. The disadvantage is that the impurity content of buckwheat is on the high side.

Trend of development

- **Development of sowing technology and equipment of buckwheat**

(1) Research and development of key technology and equipment for precision sowing of buckwheat.

According to the grain characteristics and planting characteristics of buckwheat, the key technology and equipment of buckwheat strip sowing, sowing depth stability technology and equipment, seed bed forming technology and equipment were studied. Integrated development of buckwheat precision seeder.

(2) Study on anti-clogging technology and equipment of furrow opener under no-tillage condition.

According to the characteristics of the previous crop straw, the straw cutting mechanism was studied, and the anti-blocking technology and equipment of furrow opener under no-tillage were studied. To explore the possibility of planting buckwheat under conservation tillage.

(3) Research and development of key technologies of plot breeding seeder.

According to the requirements and operation characteristics of mechanized planting in plot breeding, the research on key technologies and equipment such as quantitative transportation and diversion, seed cleaning, accurate quantitative planting and regulation were carried out. A strip seeder suitable for planting in the plot is developed to realize the sowing requirements of the quantitative seed corresponding to the quantitative area of the plot.

(4) Research and development of intelligent monitoring system for planter.

According to the working requirements of the seeder, carry out the research and development of intelligent regulation system and quality monitoring system. For example, the monitoring of sowing depth, sowing rate, plant distance, missing sowing, blocking and other parameters.

- **Development of diversified buckwheat harvesting technology and equipment**

(1) Research on the integration technology of agricultural machinery and agronomy.

It includes the study on the adaptability of buckwheat cultivation mode and mechanical operation, the coupling mechanism and biomechanical characteristics of stem, grain and machinery, and the effect of mechanical harvesting on product quality. To provide basic support for the research and development of related equipment and technical promotion.

(2) Development and demonstration of buckwheat harvesting equipment in hilly and mountainous areas.

It includes the hilly and mountainous harvester general chassis, working device attitude control system, detection and control system research and development. Research and development of cutter-rower, picking harvester and buckwheat grain combine harvester suitable for buckwheat grain harvest. Emphasis will be placed on solving the technical problems such as serious grain damage during buckwheat threshing, difficulty in threshing and separation and easy blockage when the stem moisture content is high. A series of products suitable for mechanized harvesting in hilly and mountainous areas will be formed, and demonstration and promotion in different main producing areas will be carried out.

(3) Research and development of buckwheat plot combine harvester and single ear thresher suitable for variety breeding and pilot-scale promotion.

The main purpose of this paper is to solve the technical problems such as serious threshing damage and no self-cleaning function. Improve the level of automation and intelligence to meet the requirements of variety breeding and testing. Carry out application and technology promotion to promote the improvement of industrial technology level.

(4) According to the operation requirements of different production areas, the formulation of technical specifications and quality standards for mechanized harvesting operations will be carried out, which will provide technical support for promoting the mechanization and standardization of buckwheat production.

CONCLUSIONS

This paper analyzed the main planting provinces of buckwheat and the output of buckwheat in each province in China in recent years. The research status of Chinese scholars on mechanized sowing and harvesting of buckwheat was summarized. The typical working machines and characteristics of them were analyzed. The future development trend of buckwheat mechanized production technology was pointed out. These will provide a reference for promoting the development of China's buckwheat industry.

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