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Millet Crop Economy and provides Global Human per Capita Energy

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Abstract

China ranks first in the production of foxtail millet in the world.-Foxtail millet is grown across the entire country, but the principal growing region is within latitude 32°N to 48°N, and longitude 108°E to 130°E. Twelve provinces are included in this region, holding more than 95 per cent of the total growing area in the country.

Keywords: Sichuan; Water logging; Japanese millet; Growing conditions; Entire country; Growing areas

Introduction

Foxtail millet is an important crop grown for food and feed in China. It is one of the main cereal crops in northern China, where the most important crops are wheat and corn. Foxtail millet, sorghum, sweet potato and soybean are of secondary importance. In southern China, foxtail millet is a minor crop. Proso millet grown in northwest China is an important crop and in certain regions it is the main crop. There is considerable production in northeast China as well but considering the entire country, it is only of minor importance. Finger millet is a minor cereal in China, mainly scattered in the provinces of the southern and south western parts of the country, such as in the south east of Tibet, Yunnan, Guizhou, Sichuan, Hubei, Jiangxi, Zhejiang, Fujian and Guangdong provinces. Japanese millet is cultivated in scattered patches in the lowlands and semi-arid regions in the north, distributed in Heilongjiang, Jilin, Liaoning, Hebei, Shandong, Jiangsu provinces [1]. Job's tears is a medicinal crop produced mainly in the wide area south of33°N latitude in China, such as Hebei, Shanxi, Henan and Hubei. It is also grown in Shandong, Anhui, Sichuan, Yunnan, Guizhou, Hunan, Jiangxi, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi and Taiwan provinces. It can grow on uncultivated land where drought and water logging often take place. The total production of foxtail millet in China was 7.55 million metric tonnes in 1983.So, the yield per hectare was 1,846 kg which is relatively high for this crop [2]. It is incorrect to consider foxtail millet as a low yielding crop, the actual problem being that growing conditions in many areas are rather poor.

Discussion

The climate in the principal growing regions of foxtail millet is characterized by moderate temperatures and low precipitation. Much of the millet is grown on hilly and mountainous land and foxtail millet prefers warm and sunny conditions. Its growth period is rather short and it tolerates drought and low soil fertility. It requires water in the later stages of growth, but water logging is harmful. The environmental conditions in the principal growing regions are very suitable to foxtail millet cultivation. Proso millet is the second important millet in China. Though precise statistical figures are not available, experts estimate that this crop is now grown on about 1.3 million hectares. However, it was approximately 2 million hectares in 1957 [3]. The crop is distributed over and semi-arid areas of north, northwest and northeast of China. The main growing regions are Inner Mongolia, Shanxi, Gansu, Ningxia and Heilong jing. There is only sparse cultivation in other areas. Proso has an even a shorter growth period and is more tolerant to drought and salinity as it can grow under 0.35 per cent salt content. Under drought and poor soil conditions, proso millet gives a yield which surpasses the yield of all other crops. Small millets are very widely distributed in various ecological environments in China. During the long history of domestication and cultivation, small millets have derived a great diversity in genetic resources [4]. In the late 1950'sand early 1960's China began to collect plant genetic resources of field crops from all over the country. More than 40 kinds of crop plants totalling about 200 thousand accessions were collected, including foxtail millet, proso millet and other small millets. The collection of foxtail millet genetic resources began in the 1920s and large number of land races was collected in 1950s. According to the statistics of Conference of Field Crops, about 20,000 accessions have been collected, including a number of duplicates. In 1954-55, the author was in charge of field observations, selection and elimination of duplicate materials collected from Hebei Province. During 1956, identification of 3500accessionscollectedfrom Hebei and Shandong provinces Small Millets were carried out at the Institute of Crop Breeding and Cultivation, CAAS. Similar collection works have been carried out by other scholars and these materials are generally maintained by provincial agricultural academies [5]. In the 1980s, several thousand accessions of foxtail millet were collected through large scale crop re-collection in Shanxi, Yunnan, Guishou, Goangdong, Hunan, Hubei, Jiang xiand Xinjiang Provinces. A few foxtail millet land races were also obtained from various collection activities. Another accession's were collected from Tibet in 1984. Up to now, 350accessionsof foxtail millet has been introduced to China from foreign countries. We welcome the exchange of germ plasm with other countries and the Institute of Crop Germ plasm Resources, CAAS is responsible for this task. Dr. XuYun-Tian reported that 3,226 land races are stored in the Institute of Crop Germ plasm Resources. Besides, about 12,000 accessions of foxtail millet are held in local agricultural institutes in the northern part of China. Seed viability is maintained by rotational planting infields. Usually, seeds are stored in seed depots, where the temperature and moisture are low and regenerated a tan interval of three to five years [6]. In Qinghai Province, because of its dry summer and cold winter, a medium term storage seed depot was built using natural low temperature and moisture for conserving seed materials. Other methods like locating seed storage facilities in very dry places, or storing small

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Received: 03-Mar-2023, Manuscript No. RROA-23-93291; **Editor assigned:** 06-Mar-2023, PreQC No RROA-23-93291 (PQ); **Reviewed:** 20-Mar-2023, QC No RROA-23-93291; **Revised:** 24-Mar-2023, Manuscript No. RROA-23-93291 (R); **Published:** 31-Mar-2023, DOI: 10.4172/2375-4338.1000355

Citation: Olumayowa M (2023) Millet Crop Economy and provides Global Human per Capita Energy. J Rice Res 11: 355.

quantities of seeds in moisture proof containers have also been put to use. At present, about 2,000 accessions are stored in a medium term bank at the Institute of Crop Germ plasm Resources, CAAS Beijing, at temperature -100C, in tight cans. Above all, a new gene bank for long term storage is already functioning in Beijing, and will conserve about thousand accessions of foxtail millet seeds in next five years at temperature -18°C and relative humidity of 50 percent in sealed vacuum cans. Characterization and evaluation Characterization for more than 20 agronomic and biological descriptors concerning plant morphology and yield characteristics has been underway for many years. More detailed observations on 60 or more descriptors were also made on 3,000 foxtail millet accessions and information on data cards are put in computerized CAAS ICGR Millet Germ plasm Data Bank. So far, individual research needs are met according to the selection and breeding requirements such as pathological resistance, stress resistance, blast, downy mil dew and kernel smut resistance, drought tolerance, salt endurance and nutritional quality needs [7]. Recognizing the role of improved varieties in agricultural production, many regional breeding organizations were established during the 1950's. Germ plasm of foxtail millet, are diverse in morphology and adaptability. Since the 1920's land races were collected and selections were carried out; by the end of the 1940's, several varieties such as Yanjing, Huanong and Biangu were released for cultivation. In the beginning of the 1950's many local varieties were evaluated and extended to farmers. Meanwhile, single-ear and bulk selection approaches were followed at many research organizations and from the later part of the 1950's to early 1960's, pedigree selection became a primary approach. In 1959, the first variety Xinnong dong was bred through hybridization [8]. By the 1970's 50 per cent of the varieties used in production were derived from hybridization breeding which has been the main method of foxtail millet improvement in the country. Induced mutation breeding by irradiation also started in the 1970's. Achievements in developing male sterile lines in foxtail millet have been made, and a line with high male sterility was reported, and hybrid F1 seeds could be produced by the two-line method. Most of the land races could restore fertility when crossed with the male sterile line. Since some 5 per cent seeds could be harvested from the sterile line under open pollination, no maintainer line is necessary. Foxtail millet is essentially a self-pollinated crop and usual breeding methods are all applicable and effective. Varieties introduced from abroad mostly exhibited poor adaptability and were susceptible to diseases. Direct use of this exotic germ plasm was rare. However, a few lines from Korea showed good adaptability and grew well. From these introductions the varieties such as Yonyi and Jigu were selected for direct use. Many introductions have been used as parents in hybridization. Therefore, we are interested in extending the scope of introduction from foreign countries. Single-ear selection was effective in the early stages, particularly in the landraces having many derivative forms. However, continuous selection was not so effective in pure lines or homogeneous landraces [9]. Since the floret of foxtail millet is very small, hand emasculation is very difficult and ineffective. During the 1950's hot water emasculation technique was developed and widely used. But emasculation with hot water or other chemicals can hardly be complete. So, normally a dominant marker character is used to identify true Fls. In a hybridization programme, parents should be carefully chosen to produce genetically superior progenies. In special cases, interspecific hybridization may induce sterility, which is considered to be one of the ways of generating male sterile lines. Rapid generation advancement In China, rapid generation advancement and overstepped advancement of selection are widely followed. Three major locations for the regional test of foxtail millet cultivars were established namely high land spring sowing region, north China plain summer sowing region, and northeast China spring sowing region. In provinces, there are provincial, districts and country regional tests sponsored by local evaluation committees. The national evaluation committee for regional tests is responsible for the evaluation of eight crops including foxtail millet. In north China, there are 12 provinces and districts where breeding units for foxtail millet are located. In them, there are several provincial academies of agricultural sciences that have undertaken primary work on foxtail millet breeding in Hebei province, Shanxi province, Heilong jiang province, Jilin province, Inner Mongolia Autonomous Region, Shandong province and Henan province. The present breeding goal is to develop varieties that are suitable for spring and summer sowing, have high yield potential, good stress resistance and good eating quality. Specific varieties are also bred for areas with one or two major problems, like drought or/and cold weather, etc. Utilization of heterosis in foxtail millet has been included as one of the breeding goals. Establishment of national seed companies was necessary to cope up with the multiplication and promotion of improved varieties. Localization of certain varieties in some areas necessitates seed production, standardization and mechanization of foxtail millet cultivation. More than 2,300 seed companies have been established at various levels of local government provincial, district and country level. Multiplication of seed is undertaken according to the national seed production procedures. Since foxtail millet has a high reproductive rate, field selections, which is a traditional method, can still be used by farmers who might probably develop certain special types for steadying the foxtail millet production in their areas [10]. The main millet growing areas of USSR are the Volga region and parts of Kazakhastan, which are characteristic of semi-arid conditions, with an annual rainfall of 250-400mm. As only 35to 40 percent of the precipitation is received during the crop growth period, the breeding strategies are to evolve suitable varieties for these conditions.

Conclusion

Many improved varieties have been developed at the Millet Breeding Department of the Agricultural Research Institute for South east Regions located at Saratov and these varieties have occupied more than 50 per cent of the millet growing area in the U.S.S.R.

Acknowledgement

None

Conflict of Interest

None

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