

Bitter Guard and Adzuki Bean – Rare in Europe Vegetables Originated from China Can be Grown in Poland

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Abstract. Bitter guard (*Momordica charantia* L.) and adzuki bean (*Phaseolus angularis* (Wild.) W. F. Wright) are vegetable species rarely grown in Europe of the Chinese origin. They are widely cultivated in the Far East of Asia. The first species has very low amount of sugars and therefore is highly recommended in the diet for all diabetic people, the latter has many nutritious compounds helping to reduce blood pressure, acting as natural diuretic to reduce human overweight and is being used by supermodels to remove toxins and improve overall skin texture. In the years 2007-2008 several cultivars of both species were tested at the Agricultural University in Poland. It has been proved that the first species can be successfully produced both in the plastic tunnels and in the open field and the latter in the field in our climatic conditions. They both gave satisfactory yield of fruit and set seeds, which were able to germinate.

Keywords: *Momordica charantia*, bitter guard, *Phaseolus angularis*, adzuki bean

INTRODUCTION

In China, vegetables play a key role in the kitchen. At present, in the country, there are over 100 species of vegetable commercially grown (Chen, Zhang, 1996). They are eaten ordinary by Chinese 2-3 times a day, i.e. more often than rice itself. Out of big range of them, some are of very unique value due to content or lack of very specific and valuable chemical compounds. On the other hand, quite a big group of them has been rarely grown or practically unknown to the Europeans.

Two of such vegetables are bitter guard (*Momordica charantia* L.) and adzuki bean (*Phaseolus angularis* (Wild.) W.F. Wright). The first one (Chinese name: *kugua*) belongs to the *Cucurbitaceae* family and is famous in China for its extremely low amount of sugars. Therefore, its fruit are highly recommended for diabetic people (Zhe, 1996; Desborough, 1999). The second one (the Chinese name: 'hongdou') belongs to the *Fabaceae* family and has in its seeds chemical many nutritious compounds helping to reduce blood pressure, acting as natural diuretic to reduce human overweight and is being used by supermodels to remove toxins and improve overall skin texture (Anonymous, 2006, Brundage, 2006, Anonymous, 2009a and b; Kelly, 2009). Moreover, it has been proved that regular eating of its seeds may slow down the aging process in a human body through lowering the amount of free radicals and protect the liver from dangerous chemical compounds (Han *et al.*, 2004).

The main purpose of the research was to find out whether both species of vegetables can be grown in the Polish weather conditions and see if the plants can set seeds, which then could germinate.

MATERIALS AND METHODS

The seeds for the experiment were second generation ones (R_2) and came from commercial seed companies from China. All of the tested cultivars: 7 for bitter guard and 8 for adzuki bean were developed in China in the vegetable institutes and transferred to seed companies. Three adzuki bean cultivars were locally developed. They were selected from other breeding materials and cultivars and routinely multiplied by seed growers as home-saved seeds.

Bitter guard transplants used in the experiment were received after keeping the imbibed seeds for 3 days at 30°C and then sowing them into a regular cell-trays filled with a mixture of peat and sand used to commercial transplants production. They were prepared by a Polish plant breeding and seed production company - "W. Legutko". Part of the transplants was left in the company and grown in the plastic tunnels. The plants were then transported to the Poznań University of Life Sciences Experiment Farm in Baranowo and planted at the beginning of May in the field. They were cultivated there in two ways: climbing on the sticks or laying directly on the soil.

Adzuki bean seeds were first presoaked in water overnight and then sown directly in the field in the second half of May onto garden beds in two rows system. The plants were grown as any other beans with routine fertilizing and disease and pests control. They were also regularly weeded by hand and irrigated by hand watering.

During the vegetation of the plants, the routine observations were carried out as to habit of plant growth, blooming time and scheme, male and female flowers sets, setting seeds, disease and pest occurrence and values of the produced fruit. The seeds were then collected, dried, cleaned and set up for a regular germination test to see if they could ripen in the climatic conditions in Poland.

RESULTS AND DISCUSSION

The carried out experiments proved that both species could be grown successfully in Polish climatic conditions. The bitter guard when grown under plastic tunnels had normal blooming and when grown for two shoots could provide satisfactory fruit yield. If it was grown in the field, two methods of production could be used: climbing on the sticks or lying directly on the field (Tab. 1). In both cases, blooming was satisfactory and fruit set big. This is in agreement with the remarks of Robinson and Decker-Walter (1996). The biggest problem in the production in the plastic tunnel was virus disease caused by Cucumber Mosaic Virus. However, no significant differences amongst tested cultivars were observed. In one plastic tunnels 2-3 plant for this reason had to be eliminated. The only problem with bitter guard observed when grown in Poland was aphids. The aphids were chemically controlled.

All of the tested by us bitter guard cultivars had good blooming with no pattern of it. There was a tendency to set more male flowers on the main shoot than on the side ones. This is in agreement of other cucurbit species, e.g. cucumber or melon, in which male flowers are dominating on main branches and female on side branches (George, 1985). There were no difference in blooming time of all tested 6 cultivars. They started to bloom in the middle of June and continued to bloom till the first frosts, i.e. till the beginning of October. The developed fruits had different colour, weight and size (Tab. 2). They differed also in number of fruit per a plant. The chemical analyses of six selected bitter guard cultivars showed that there were differences amongst them in the content of the compounds responsible for their bitterness. The observation was also confirmed by testing the fruit by breeders from a Polish

seed company. The received results were satisfactory. The temperature of growth of the plants in the experiment was close to the minimal one, which is 18°C (Larkcome, 1991), but far below optimal, which is 24-27°C (Desai and Musmade, 1998).

Tab. 1

Main production characters of bitter guard and adzuki bean grown in Poland

Genera	Seeds	Transplants	Methods of production	Susceptibility to diseases and pests	Seed setting	Usefulness of fruit for processing
Bitter guard	Need pre-cooling	Yes	On sticks or laying on the ground	Cucumber Mosaic Virus and aphids	Good or very good	Till first frosts
Adzuki bean	Don't need any pre-treatment	No	On the garden beds or flat field	Anthracnose, wild mold, aphids and bean weevil	Good or poor for very late cultivars	Dry seeds available all year round

Tab. 2

Selected characters of fruits of six bitter guard Chinese cultivars grown in Poland

Cultivar	Size (cm)	Colour	Weight (kg)	Number of fruits per plant
Lanshan	40-60 x 8	White	1-2	7
Qingfeng	40-60 x 5	Green	1-1.5	6
Meiyin	35 x 6	Dark green	0.5	2.5
Tailan	17-25 x 8	Light green	0.4-0.6	2.5
Daguo	40-45 x 8	Green	1-1.2	6
Luxiu	30-35 x 6	Green	0.4-0.6	2.5

The adzuki bean was successfully grown in the field in the conditions of Poland. Although late (Tab. 3), the plants of the 5 cultivars out of 7 tested eventually bloomed and gave pods with seeds, which germinated. Three of them were outstanding and their yielding level was similar to the one in the Chinese conditions. The local cultivar from the Northern part of China gave the lowest yield but still it was satisfied and seed quality was good (Tab. 3).

Tab. 3

Selected characters of three adzuki bean Chinese cultivars grown in Poland

Cultivar	Blooming time	Growth habit	Yield (kg/ha)
Jing Nong 7	Aug. 22-Sept. 12	Straight, compact	1875
Ji Hong 9218	Aug. 25-Sept. 8	Straight, compact	1680
Heilongjinag (local)	Aug. 20-Sept.12	Semi-straight, loosen, easy-lodging	1500

The weather in 2008 was good to grow in the field warm-season crops and long and warm autumn helped to collect seeds. This is in agreement with the earlier information of Hardamn *et al.* (1989) about high thermal requirements of the species. Despite report of Harada and Kondo (2009), no serious problems of diseases and pests were observed except removing a few plants with the symptoms of anthracnose and chemical control of aphids and bean weevils. Although the received seeds of the five cultivars were ripen late (beginning of October), they were fully ripen and germinated without a problem. This is in agreement with the observations of Stephens (2009) who easily got adzuki bean seeds. Through our

experiment, it had been proved that way that bitter guard and some cultivars of adzuki bean can be grown in the Polish climatic conditions.

REFERENCES

1. Anonymous (2006). Adzuki bean. www/en.wikipedia.org/wiki/adzuki.bean
2. Anonymous (2009a). Organic adzuki bean. www.mind:co/product/show/2702-adzuki-bean-and-oat-meal-organic-vegan-skin-scrub.
3. Anonymous (2009b). Adzuki bean.
4. www.gmo.compass.org/ang/database/plants/331.adzuki-bean.html.
5. Brundage, C. (2006). Our DIY guide to gorgeous, www.tbt.com.tbt*/Tampo-Bay-Times.
6. Chen, H. and Y. Zhang (1996). Atlas of the traditional vegetables in China. Zhejiang Sci. Technol. Publ. House, Hangzhou.
7. Desai, U. T. and A. M. Musmade (1998). Pumpkins, squashes and guards. In “Handbook of Vegetable Science and Technology: Production, Composition, Storage and Processing”. (Ed. Salunkhe D.K., Kadam S.S.) Marcel Dekker, New York, 273-298.
8. Desborough, P. (1999). Emerging Opportunities in Agriculture. Adzuki bean. www.Newcrops.uq.edu.au/newslett/unc11889.htm
9. George, R. A. T. (1985). Vegetable Seed Production. Longman, London, New York.
10. Harada, G. and N. Kondo (2009). Adzuki bean leaf infection by *Phytophthora vignae* f.sp. *adzukicola* and resistance evaluation using detached leaves inoculated with zoospores. *J. Gen. Plant Path.* 75:52-57.
11. Han, K. H., M. Fukushima and K. Ohba (2004). Hepatoprotective effects of the water extract from adzuki bean hulls on acetaminophen-induced damage in rat liver. *J. Natr. Sci. Vitaminol.* 50(5):380.
12. Hardamn, L. L., E. S. Oplinger, J. D. Doll and S. M. Combs (1989). Adzuki Bean. *Alternative Crops Manual*. www.ask.com/bar?q=adzuki-bean&page=18qs...
13. Kelly, L. (2009). Adzuki Bean: Healthy Benefits and Nutrition Information. Knowingfood.co/nutria/odinfo.html.
14. Larkcome, J. (1991). *Oriental Vegetables. The Complete Guide for Garden and Kitchen*, John Murray, London, p. 232.
15. Robinson, R. W. and D. S. Decker-Walter (1996). *Cucurbits*. CAB Intern.
16. Stephens, J. M. (2009). Bean, Adzuki – *Phaseolus angularis* (Wild.) W.F. Whight. EDIS, Univ. Florida, IFAS Extension, www.edis.ifas.ufl.edu/MM016.