Investigating stimulated ripening indicators of longbeak rattlebox (*Crotalaria*) planted in the coasts of the Aral Sea

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Abstract. In recent years, the coast of the Aral Sea region has been undergoing comprehensive reforms aimed at fundamentally improving the environmental situation, accelerating the socio-economic development of the region, and increasing the lifestyle and income of the population. In Uzbekistan, great attention is paid to the effective use of selection, seed production and modern agro-technologies to increase the yield of fodder crops and improve the quality of grain. In particular, a lot of attention is paid to the productive use of saline lands in the strengthening of the feed base in animal husbandry, and various crops are planted in saline areas. In this article, samples of the longbeak rattlebox crop were planted in the coast of the Aral Sea, which has a unique natural climate. In addition, phenological measurements were carried out and the results obtained for each sample of valuable economic traits are presented. In the coast of the Aral Sea, seeds of 110 samples from the National Genbank were sown in 4 repetitions, an experimental nursery was established, and the results of valuable economic traits were studied and presented based on phenological observations and statistical analysis.
Keywords. Aral Sea, crotalaria, longbeak rattlebox, coastal region, *Crotalaria juncea*.

1 Introduction

Currently, there are about 600 species of plants of the genus *Crotalaria*, and 6-7 species are cultivated and grown in India, Australia, Africa and other tropical and subtropical countries as fiber, green manure, fodder, food, and medicine [1]. The main fiber producing countries from *Crotalaria juncea* are India, Sri Lanka, South and South East Asian countries. In these countries, in the last decade, fiber yield was 0.12-0.6 tons/ha in India and 0.45 tons/ha in Sri Lanka, and seed yield was 10-22 tons/ha depending on soil conditions [2].

The homeland of the longbeak rattlebox is South Asia. To this day, various species of longbeak rattlebox are found in India, Sri Lanka, South and Southeast Asia, and Transcaucasia [3]. Recently, there has been a great interest in Africa. Cratalaria is a

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perennial or annual herb with a height of 30 cm to 10 m, semi-shrubs or shrubs, depending on the species.

Longbeak rattlebox stems are herbaceous or woody. The leaves are simple, entire or trifoliate, sometimes difficult to structure, the leaves consist of 2-7, and then the shoots are low in number (in this case, the stems are winged) [4]. The lateral leaves are not very large and do not grow together with the leaf band or not at all. Longbeak rattlebox (in latin *Crotalaria*) is a large genus of plants belonging to the legume family (*Fabaceae*). *Crotalaria juncea* plant is adapted to different soil and climate conditions by its biological properties. The seed as a food product; hay as a high-calorie fodder in animal husbandry; in increasing soil fertility in agriculture and improving land reclamation; in the treatment of various diseases in medicine; and a source of nectar in beekeeping; can be used as a source of fiber for light industry [5].

When Crotalaria (*Crotalaria juncea*) was planted in the optimal period (April 20-24) and at the rate (14 kg/ha), a high grain yield (18 quintals/ha) was obtained, and the additional yield was 5.9 quintals/ha. The correlation coefficient between the number of pods and the grain yield is $r = 0.566$ ($R^2 = 0.320$), the regression level is $b_{xy} = 0.496$, the difference between the correlation and its error is equal to tr=1.8, and it is noted that there is an average level of correlative dependence [6].

When crotalaria (*Crotalaria juncea*) is planted at 14 kg/ha on April 20-24 in conditions of meadow alluvial soils of Khorezm region in Uzbekistan, the highest net income is 9,057,764 UZS/ha and the rate of profitability is 105.2%, additional net income is up to 1,031,100 – 5,283,600 UZS/ha profit received. Srotalariani during the period of April 20-25, when 18 kg of fertile seed per hectare was planted, the highest hay yield was 173.9 quintals/ha, conditional net profit was 6,829,563 UZS/ha and the profitability rate was 59.7% [7, 8].

The fecundity of 110 samples of longbeak rattlebox was studied and the fecundity of the samples ranged from 7.5 to 9 days. The average of 110 samples was found to be 8.5 days. Among the 110 samples in the longbeak rattlebox catalog, 3 samples had a short day, namely, the 39th "*Crotoloria ineona*", the 60th "*Crotoloria spactabilis*" and the 65th "Crotoloria incona" samples were 7.5 days [9]. It has been found that the thicker the Crotalaria alata plant, the faster the growth of the plant, but the flowering and ripening periods are delayed by 2-3 days, even 4-5 days. Also, it has been determined in experiments that it is possible to plant srotalaria alata as a siderate crop and grow cotton or rice instead, and get an abundant harvest [10].

In order to develop an efficient agrotechnology of cultivation of alfalfa in saline areas, the seeds of the Kibray variety of alfalfa and the Tashkent-1 variety of ordinary blue alfalfa were planted in different options and at different sowing rates in 4 options for comparative study. In the following years, the yield of winter wheat in Alabama increased, and the cultivated area expanded to 97,000 hectares. In 2008, $85 million worth of wheat was sold in Alabama. Here, it was found that the reason for the higher yield than wheat was that the legume srotalaria juncea was planted in these fields before wheat [10-13].

As it can be seen from the above information, it is possible to grow crotalaria plant in saline areas and get a high yield. Srotalaria can be used in agriculture to improve soil fertility, as animal fodder, as a seed food, and in other ways, and this plant requires further study.

2 Materials and methods

It is known that the fertility of some agricultural crops and other valuable economic traits decrease in saline soil climate. In order to study planting in the natural soil and climate conditions of the coast of the Aral Sea, an experimental nursery was established in

Chimboy district based on 110 samples of the longbeak rattlebox crop available in the National Gene Bank. These samples were taken from different countries at different times.

These 110 samples of crotalaria were planted and studied in the experimental lands of the Agricultural Research Institute in Chimboy district of the Republic of Karakalpakstan in Uzbekistan.

3 Results and discussion

From the data in the table below, we can see that compared to other samples, the average germination time for *Crotoloria ineona* (Sn. 39), *Crotoloria spactabilis* (Sn. 60) and *Crotoloria incona* (Sn. 65) was 7.5 days, while for all other samples it was 8.0 to 9.0 days. was found to have germinated in the interval (Table 1).

When we determined the flowering index of the studied collection samples of crotalaria plant by day, we found that *Crotoloria ineona* (Sn. 24), *Crotoloria juncea* (Sn. 28), *Crotoloria ineona* (Sn. 40), *Crotoloria juncea* (Sn. 56), *Crotoloria juncea* (Sn. 68), *Crotoloria juncea* (Sn. 74), *Crotoloria Montana* (Sn. 78), *Crotoloria juncea* (Sn. 80) and *Crotoloria spectabilis* (Sn. 94) were 32 days. It was 36 days in the sample of *Crotoloria juncea* (Sn. 27), and in all other samples it was between 32.5 and 35.5 days.

Table 1. Data of phenological observations on crotalaria samples planted in the coast of the Aral Sea (2022).

Sample number	Varietal or specimen name	Germination, day	Blooming, day	Ripening, day
1	*Crotoloria juncea*	8.5	33.5	136.3
2	-//-	8.5	33	134.3
3	-//-	9	34	135.8
4	-//-	8.5	33.5	136.0
5	-//-	8.5	35	131.0
6	-//-	8	32.5	136.3
7	*Crotoloria ineona*	9	33.5	138.5
8	-//-	9	33	135.5
9	*Crotoloria ineona*	8.5	33.5	135.5
10	*Crotoloria juncea*	8.5	33.5	133.0
11	-//-	8.5	33.5	138.3
12	-//-	9	33	134.8
13	-//-	8	33.5	139.5
14	-//-	8.5	32.5	137.0
15	-//-	8	35	136.8
16	-//-	9	33	141.3
17	-//-	9	33	135.0
18	-//-	8	34.5	140.3
19	-//-	8	33.5	135.3
20	*Crotoloria juncea*	9	36.5	132.0
21	-//-	9	33	137.8
22	-//-	8.5	32.5	135.0
23	*Crotoloria ineona*	8.5	34	135.8
24	-//-	8	32	136.0
25	*Crotoloria juncea*	9	35.5	136.3
26	-//-	8.5	33	137.8
27	*Crotoloria juncea*	8.5	36	136.3
28	-//-	8.5	32	134.5
29	*Crotoloria ineona*	8.5	34.5	135.8

30	-//-	8.5	32	131.0
31	*Crotoloria juncea*	8.5	35	134.8
32	-//-	8.5	32.5	135.0
33	-//-	8.5	33.5	137.5
34	-//-	8.5	32.5	138.3
35	-//-	8.5	34.5	134.3
36	-//-	9	33	138.8
37	-//-	8.5	34.5	130.5
38	-//-	8.5	33.5	134.3
39	*Crotoloria ineona*	7.5	34	132.8
40	*Crotoloria striota*	8.5	32.5	133.3
41	*Crotoloria ineona*	8	34.5	132.8
42	*Crotoloria juncea*	9	33	136.3
43	-//-	9	33.5	130.3
44	-//-	8.5	35	130.0
45	-//-	8.5	34	132.3
46	-//-	8.5	33	134.0
47	-//-	9	33.5	135.0
48	*Crotoloria ineona*	8.5	34.5	132.5
49	*Crotoloria juncea*	8.5	33.5	134.3
50	-//-	9	32.5	134.5
51	-//-	8	34	133.0
52	-//-	9	33	130.5
53	*Crotoloria juncea*	9	34.5	129.5
54	-//-	8.5	33.5	133.8
55	-//-	8.5	33.5	131.5
56	-//-	8.5	32	135.0
57	*Crotoloria juncea*	8.5	34	140.0
58	*Crotoloria striota*	8.5	32.5	134.5
59	*Crotoloria spactabilis*	9	33.5	135.5
60	-//-	7.5	34	137.0
61	-//-	9	33.5	134.0
62	*Crotoloria incona*	8.5	32.5	135.3
63	-//-	9	34.5	137.3
64	-//-	9	34	137.5
65	-//-	7.5	33	135.8
66	-//-	8.5	32.5	133.0
67	*Crotoloria juncea*	9	34.5	135.5
68	-//-	8.5	32	138.8
69	-//-	8.5	34.5	139.0
70	-//-	8.5	32.5	129.0
71	-//-	8.5	34	131.3
72	-//-	8	34	132.5
73	-//-	9	34.5	131.0
74	-//-	8.5	32	133.5
75	*Crotoloria incona*	8.5	35	135.3
76	-//-	9	32.5	135.8
77	*Crotoloria juncea*	8.5	33.5	133.5
78	*Crotoloria Montana*	8.5	32	133.5
79	*Crotoloria juncea*	9	34.5	136.0
80	-//-	8	32	132.3
81	*Crotoloria juncea*	8	35.5	134.0
82	*Crotoloria incona*	8.5	32.5	133.8
83	-//-	9	33.5	134.0

84	*Crotoloria retusa*	9	32.5	135.3
85	*Crotoloria spactabilis*	8.5	33.5	133.0
86	*Crotoloria Montana*	8.5	33	131.5
87	*Crotoloria juncea*	9	33.5	135.0
88	*Fu-e-e-way-ha*	8.5	33	137.3
89	*Sha-shi-luy-fai*	8	33.5	133.0
90	*Za – sheo-e-Bay-ha*	8	33.5	129.8
91	-//-	9	34.5	132.5
92	*Crotoloria Yaon-e-e-way-he*	8.5	33	135.3
93	*Crotoloria juncea*	8	33.5	136.3
94	*Crotoloria spectabilis*	9	32	132.5
95	*Crotoloria retusa*	8	34.5	132.8
96	*Crotoloria intermedia*	9	33	134.8
97	-//-	8.5	33	136.3
98	-//-	8.5	33	134.0
99	-//-	9	33.5	130.0
100	-//-	8.5	33.5	135.3
101	-//-	9	34	135.3
102	-//-	9	33.5	134.3
103	-//-	9	33.5	134.0
104	-//-	8.5	32.5	136.5
105	-//-	9	34.5	134.3
106	-//-	9	33	134.0
107	*Crotoloria juncea*	9	33	133.3
108	-//-	8	34	136.3
109	-//-	8	35	137.8
110	-//-	8.5	32.5	137.5

The fastest ripening samples were 129 days in the sample of *Crotoloria juncea* (Sn. 70), 129.5 days in the sample of *Crotoloria juncea* (Sn. 53), and 129.8 days in the sample of Za-sheo-e-Bay-kha (Sn. 90). It was 141.3 days in the sample of *Crotoloria juncea* (Sn. 16), 140.3 days in the sample of *Crotoloria juncea* (Sn. 18), and all other samples were in an intermediate state, ranging from 130.0 days to 140.0 days. When the longbeak rattlebox samples were planted in the island region and studied according to the maturity index, all the samples that matured the earliest by 132 days were selected, and these samples were 15. When the stem height and blue mass yield of these samples were studied, the following results were obtained (Table 2).

Table 2. Data of the selected samples according to their precociousnessamong the crotalaria samples planted in the coast of the Aral Sea (2022).

Sample number	**Varietal or specimen name**	**Main stem height, cm**	**Biomass productivity, quintals/ha**	**Ripening, day**
5	*Crotoloria juncea*	197	236	131.0
20	*Crotoloria juncea*	228	256	132.0
30	*Crotoloria ineona*	218	242	131.0
37	*Crotoloria juncea*	204	248	130.5
43	*Crotoloria juncea*	196	241	130.3
44	*Crotoloria juncea*	204	225	130.0
52	*Crotoloria juncea*	208	234	130.5

53	*Crotoloria juncea*	198	246	129.5
55	*Crotoloria juncea*	234	278	131.5
70	*Crotoloria juncea*	192	228	129.0
71	*Crotoloria juncea*	216	234	131.3
73	*Crotoloria juncea*	212	235	131.0
86	*Crotoloria Montana*	202	227	131.5
90	*Za – sheo-e-Bay-ha*	185	219	129.8
96	*Crotoloria intermedia*	198	237	130.0

When studying the selected samples according to the speed of yield of biomass, the highest indicator was observed in the 55th sample and made 278 quintals per hectare. The lowest yield was observed in the 90th sample and was 219 quintals per hectare. Intermediate yields were observed in the remaining samples.

4 Conclusions

As can be seen from the obtained data, in terms of quick ripening index, *Crotoloria juncea* (Sn. 53 and 70) and Za-sheo-e-Bay-kha samples (Sn. 90) were distinguished by their quick ripening compared to other samples. The highest index of biomass productivity was observed in the 55th sample and was 278 quintals per hectare. At the end of August (August 24), the height of the plant was 185-218 cm, and the highest reached 234 cm.

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