



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
JPP 2018; 7(4): 2354-2357  
Received: 09-05-2018  
Accepted: 13-06-2018

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## JRJ 610 (Prankur): A new sunnhemp (*Crotalaria juncea* L.) Variety for high yielding and superior quality fibre

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### Abstract

Sunnhemp (*Crotalaria juncea* L.) is extensively cultivated for fibre or green manure, or intercrop/cover crop and leaves are fed as a high protein supplement to other poorer feeds. Due to several biodiversified utilization of this crop, there is a requirement to develop some location specific, disease resistant, high yielding and better quality fibre variety of Sunnhemp. Since long the farmers are engaged to cultivate the traditional few varieties of sunnhemp that have very low yielding and inferior quality fibre. Keeping all of the above, an attempt has been made to develop such type of variety that contribute highly productive and better quality fibre of sunnhemp with the support of All India Network Project on Jute & Allied Fibres (AINP on JAF) by taking several multilocal evaluation trials. So, conclusion may be drawn that the variety JRJ 610 (Prankur) have been developed from five selected individual parents' viz. SUIN-01, SUIN-055, SUIN-056, K-12(B) and K-12 (Y) involving series of crosses followed by random mating in isolation and mass selection and this variety is resistant to major diseases and pest, highly productive and giving better tenacity fibre.

**Keywords:** sunnhemp (*Crotalaria juncea* L.), fibre tenacity, resistant and high yielding

### Introduction

Sunnhemp (*Crotalaria juncea* L.) known as Brown hemp, Indian hemp, Madras hemp or Sunn hemp is a tropical Asian plant of the legume family. It is generally considered to have originated in India. It is an important short-day, erect shrubby annual, generally 1 to 4 m in height. Stems up to 2 cm in diameter, cylindrical and ribbed. Leaves simple, spirally arranged along the stem, oblong-lanceolate. Strong taproot well developed lateral roots. It is now widely grown throughout the tropics and subtropics as a source of green manure and nitrogen source, fodder and lignified fiber obtained from its stem. It is showing promise as a forage legume for intercropping with upland rice. Sunn hemp should be cut for hay or ploughed in for green manure in the early flowering stage when it is 1.5-2.5 months old. Due to the shade of its dense canopy it is also used as a cover crop to suppress weed populations.

Sunn hemp is also being looked at as a possible bio-fuel. It suppresses weeds, slows soil erosion, and reduces root-knot nematode population. When ploughed under at early bloom stage, nitrogen recovery is the highest. Under optimum growing conditions sunn hemp can produce 134 to 147 lb/acre of nitrogen (N) and 3 tons/acre air-dry organic matter at 60 days of growth.

Furthermore, *Crotalaria juncea* has applications in the agricultural field since it impacts common food production. *Crotalaria juncea* is identified as a plant that is an important summer cover crop in southeastern United States. The allelopathic effects of *Crotalaria juncea* on weeds, vegetable crops and cover crops were observed via greenhouse and growth chamber experiments. *Crotalaria juncea*, reduced both the germination and seedlings of various crop species (bell pepper, tomato, onion, and others). The allelochemical activity in *Crotalaria juncea* was in the leaves and remained active for 16 days after harvest. Furthermore, *Crotalaria juncea*'s allelochemical effect may have practical applications for weed management.

Sunnhemp, *Crotalaria juncea* L. a highly cross pollinated crop that is a rapidly growing crop that is used for fibre production in India and Pakistan. It is well known for its coarse textured pectino-cellulosic fibre with good fibre characteristics and high yield which is used for manufacturing of wide variety of products like paper, marine cordage, rope, string and fishing net, coarse for hose pipe, belting and canvas, tissue paper, bank currency, rugs, carpets, webbing etc.

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**Breeding objectives**

To improve the fibre productivity with enhanced fibre quality and resistance to biotic stresses.

**Parentage and breeding method used**

The variety JRJ 610 (Prankur) has been developed by ICAR-Central Research Institute Jute & Allied Fibres (ICAR-CRIJAF), Barrackpore from five selected individual parents' viz. SUIN-01, SUIN-055, SUIN-056, K-12(B) and K-12 (Y) involving series of crosses followed by random mating in isolation and mass selection. Synthesis of population involving series of crosses using these selected parents with high gca effects followed by random mating in isolation and mass selection with an objective to accumulate genes of desired traits including fibre yield, fibre strength and reaction to diseases.

**Special recommendation of this variety**

The crop being leguminous may grow in the nutrient deficient soils, acting simultaneously as a very valuable soil builder. Presently due to growing of high yielding rice and wheat, the organic carbon status of soil has been depleted. Thus, the cultivation of sunnhemp will help to enrich organic carbon content of the soil. K-12 (Yellow), SUIN 053 and SH 4 are the only varieties which covers almost all the niche area of sunnhemp. Therefore, this variety can replace or supplement

the widely cultivated varieties like K-12 (Yellow) and SH 4 having higher yield coupled with better fibre tenacity and tolerance to vascular wilt. The proposed variety will eliminate the risk of cultivation of single variety and minimize the risk of vulnerability to diseases and pests.

**National Identity Number**

This variety have been identified and released by "Central Sub-Committee on Crop Standard, Notification and Release of Varieties of Agri-Horticultural Crops" and having the national identity number IC599878 assigned by National Bureau of Plant Genetic Resources (NBPGR), ICAR, New Delhi.

**Area of adaptability and production ecology**

This variety is suitable for irrigated as well as rainfed upland and medium upland agro-ecological situation for growing during mid-April to last week of May in all sunnhemp growing states like Uttar Pradesh, Bihar, Rajasthan, Maharashtra, Odisha, Madhya Pradesh and West Bengal. This variety is suitable for the prevalent cropping sequences of sunnhemp followed by transplanted aman paddy in irrigated as well as rainfed agro-ecosystem in North India.

**Salient varietal characteristics**

The salient features are narrated in below-

SL No.	Characters	Features
1.	Growth habit	Less branching with rudimentary auxiliary buds on leaf axils
2.	Stem	Cylindrical, ribbed surface
3.	Stem color	Completely green, 1.0-1.3cm in diameter
4.	Plant height (cm)	270-290
5.	Leaf shape	Oblong
6.	Leaf length and width (cm)	Length 15 cm & width 2.3 cm
7.	Leaf color	Green
8.	Fruit	Indehiscent
9.	Seed coat color	Deep brownish grey
10.	Harvestable maturity (Fibre purpose)	90-100 days
11.	Harvestable maturity (Seed to seed maturity)	130-140 days
12.	Flower: Petal color	Yellow
13.	Days to flowering (50%)	70-75 days
14.	Seed test weight (g)	42.0
15.	Fibre yield (Average)	10.44q/ha
16.	Fibre strength (g/tex)	13.19
17.	Resistant to diseases	Vascular wilt

**Selection of field/land preparation**

The land should preferably be well drained in nature having medium fertile and properly pulverized soil. The soil should have sufficient moisture at the time of germination. Being leguminous crop, it may grow on the nutrient deficient soils, acting simultaneously as a very valuable soil builder.

**Seed treatment**

Treat the sunnhemp seed with Carbendazim 50WP @ 2.0 g/kg seed or Mancozeb 80WP @2-3g/kg or *Trichoderma viridae* 6-8 g/kg of seed to protect from seed borne diseases and dry in shade overnight before sowing.

**Sowing time**

Suitable sowing time for fibre production is 15<sup>th</sup> April to End of May (North India) and October to November (South India). Optimum sowing time for seed production of this variety is in between Last week of July to 2<sup>nd</sup> week of August.

**Seed rate and sowing method**

Seed requirement for fibre crop is usually 25 kg/ha for JRJ 610 (Prankur) variety, if sowing through line and optimum seed rate is 35 kg/ha if sowing through broadcasting. Row to row spacing should be 20-25cm and plant to plant spacing is 5-7cm for fibre crop whereas for seed crop, row to row spacing should be 35-40cm and plant to plant spacing is 5-7cm.

**Fertilizer doses**

Being a leguminous crop there is a less amount of N should be applied. The recommended dose of fertilizer (N: P: K) is 20:18:25 kg/ha and should be applied as basal at the time of sowing.

**Weed control**

Sunnhemp is a fast growing cover crop so generally need not apply any herbicide. One hand/mechanical weeding at 25-25 DAS is enough for effective management of weed. In specific cases, application of Butachlor 50% EC or 5G @1.0-1.5 kg

a.i./ha or Pretilachlor 50%EC @0.8 to 0.9 kg a.i./ha within 48 hours of sowing is recommended.

### Disease & pest control

JRJ 610 showed higher resistance to major pest and diseases. Early sown crop was almost free from vascular wilt and incidence of sunnhemp mosaic diseases was also negligible. JRJ 610 is comparatively 22.78% resistant to vascular wilt as compared to the standard check variety, SH 4 and 25.61 % resistant to check variety, K-12 (Yellow). This variety also free from top shoot borer, hairy caterpillar and other insects and pest. In case of serious infestation of hairy caterpillar and top shoot borer in sunnhemp spraying of Profenophos 50EC @2ml/l is recommended.

### Irrigation

In early sown crop (mid-April), 1-2 irrigations are required. In monsoon crop there is no need to irrigation in sunnhemp.

### Harvesting

Approximate time for harvesting of JRJ 610 variety is 90-100 DAS for better quality fibre and higher fibre yield. For seed production, the variety attains its seed to seed maturity in about 120-130 days.

### Yield

Under the aegis of All India Network Project on Jute & Allied Fibres (AINP on JAF), Initial Evaluation Trial (IET) were conducted in randomized block design in six locations viz. Barrackpore, Kalyani, Pratapgarh, Rahuri, Aduthurai and Budbud. JRJ 610 yielded 11.89q/ha fibre, statistically at par with check varieties K-12 (Yellow) and SH 4. The variety out yielded the national checks in three locations at Barrackpore, Kalyani and Aduthurai during Advance Varietal Trials I (AVT-I). In terms of pooled mean yield, JRJ 610 (8.97 q/ha) possessed better productivity as compared to K-12 (Yellow) by 19.76% and SH 4 by 9.66%. In Advance Varietal Trials II (AVT-II), JRJ 610 out yielded check varieties SH 4 and K-12 (Yellow) at two locations by 2.44% and 0.30% respectively out of four locations at Aduthurai, Barrackpore, Kalyani and Pratapgarh. The Adaptive Trials were conducted in farmer's fields at four locations in Pratapgarh and Sultanpur district of Uttar Pradesh. JRJ 610 (10.83q/ha) out yielded over check varieties K-12 Yellow (8.31q/ha) and SH 4 (9.02q/ha) and SUIN 053 (9.21q/ha) by 30.32%, 20.06% and 17.59% respectively. The pooled data of all the trials indicated 7.42% and 5.87% superiority of JRJ 610 over check varieties SH 4 and K-12 (Yellow) respectively. On an average, this variety produces 10.44q/ha fibre. Under optimum crop management it has a yield potential of 14.98q/ha also. For seed production, this variety produces 14-16q/ha seed.

### Fibre quality

The fibre of JRJ 610 was free from anybody defects and hard roots as reported by ICAR-National Institute for Research on Jute and Allied Fibres Technology (ICAR-NIRJAFT), Tollygunj, Kolkata. JRJ 610 contributes a good combination of fibre strength 13.19g/tex that exhibits 17.87% and 10.56% stronger fibre than the check varieties K-12 Yellow (11.19g/tex) and SH 4 (11.93g/tex) respectively offer an additional benefit of better fibre quality.

### Special recommendation for seed production

Sowing in last week of July to 2<sup>nd</sup> week of August is recommended for seed production with the row to row

spacing of 35-40cm. being a highly cross pollinated crop, recommended isolation distance (400m) should also be maintained during seed production. Detopping should be at 30-35 DAS and rouging should be done at regular intervals.

### Availability of seed

The quality seed of the variety is available at the ICAR-Central Seed Research Station for Jute & Allied Fibres (ICAR-CSRSJAF), Budbud, Burdwan, and West Bengal. Seed can also be obtained from ICAR-Central Research Institute Jute & Allied Fibres (ICAR-CRIJAF), Barrackpore, Kolkata, West Bengal.

### Summary

In India, only four varieties of sunnhemp viz. K-12 (Yellow), K-12 (Black), SUIN 053 and SH 4 have been released so far for commercial cultivation. Farmers have very little choice to opt for suitable varieties for a particular agro-ecological situation. JRJ 610, owing to its 6-7% higher yield, better fibre tenacity as well as resistant to major diseases (vascular wilt and mosaic) and pest (top shoot borer, hairy caterpillar), has become more acceptable to the farmers as compared to the existing varieties. The variety will also eliminate the risk of cultivation of few varieties in larger areas and ultimately minimize the risk of vulnerability of crop to diseases and pests as it may lead genetic diversity in niche areas of its cultivation. JRJ 610 (10.83q/ha) out yielded over check varieties K-12 Yellow (8.31q/ha) and SH 4 (9.02q/ha) and SUIN 053 (9.21q/ha) by 30.32%, 20.06% and 17.59% respectively. The pooled data of all the trials indicated 7.42% and 5.87% superiority of JRJ 610 over check varieties SH 4 and K-12 (Yellow) respectively. JRJ 610 contributes a good combination of fibre strength 13.19g/tex that exhibits 17.87% and 10.56% stronger fibre than the check varieties K-12 Yellow (11.19g/tex) and SH 4 (11.93g/tex) respectively offer an additional benefit of better fibre quality. On an average, this variety produces 10.44q/ha fibre. Under optimum crop management it has a yield potential of 14.98q/ha also. For seed production, this variety produces 14-16q/ha seed. Due to these reason, it is recommended for release and cultivation for entire sunnhemp growing belt of the country.



**Fig 1:** General view of the variety, JRJ 610 (Prankur) at flowering stage.

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