

## AINP on Jute & Allied Fibres 2010-11

All India Network Project on Jute and Allied Fibres with its HQs at CRIJAF functions through 9 SAU-based centres and an ICAR institute-based centre. In the year 2010-11, a total of 50 projects were evaluated on jute (*C. capsularis* and *C. olitorius*), mesta (*H. sabdariffa* and *H. cannabinus*), sunnhemp (*Crotalaria juncea*), ramie (*Boehmerianivea*), sisal (*Agave sp.*) and flax (*Linum usitatissimum*) relating to crop improvement, crop production and crop protection aspects.

### 1. Crop Improvement:

A total of 27 projects were evaluated under crop improvement programme. Twelve projects were evaluated for jute, nine for mesta, two for sunnhemp, three for ramie and one for flax, including germplasm evaluation, national hybridization programme, initial evaluation trials, advanced varietal trials-I, advanced varietal trials-II and adaptive trials. Overall, 114 trials were conducted at different centres.

#### 1.1. Varieties Identified for release

Five varieties, viz. JRO-2407 of tossa jute, KJC-7 of white jute, JBM-75 of kenaf, JRR-07 and AHS-160 of roselle have been identified by the Variety Identification Committee in the 26<sup>th</sup> Annual Workshop of All India Network Project on Jute & Allied Fibres held at Lake Hall, Kalyani, W.B. on 5<sup>th</sup> and 6<sup>th</sup> February, 2011.



Hon'ble DDG (Crop Science), ICAR inaugurating the 26<sup>th</sup> Annual Workshop of AINP on Jute & Allied Fibres at BCKV, Kalyani



Welcome address by Prof. (Dr.) B.S. Mahapatra, Director, CRIJAF



Inaugural address by Hon'ble DDG (Crop Science), ICAR



Release of JAF news & other publications by the Dignitaries

## 1.2. Evaluation of germplasm

### 1.2.1. Jute

Fifty accessions of *C. capsularis* and *C. olitorius* each were tested in different locations in 2010-11.

***C. capsularis*:** Most of the accession outperformed check at Coochbehar and Katihar, but none was superior at Kalyani. CEX-04 was found to be superior at Coochbehar, Bahraich and Katihar. Highest fibre yield was observed in Kalyani.

***C. olitorius*:** Majority of the accessions outperformed check varieties in Katihar, Coochbehar and Bahraich for fibre yield, but none was superior at Kalyani. Highest fibre yield was observed in Katihar location.

### 1.2.2. Mesta

Thirty seven accessions of roselle (*H. sabdariffa*) were evaluated. Out of which four accessions exceeded the fibre yield over the best check variety AMV-3 (15.40 g pl<sup>-1</sup>). The promising accessions were AR-48, AS-80-29, AR-88 and AS-80-7.

## 1.3. National Hybridization Programme

***C. capsularis*:** F<sub>6</sub> generation of 25 cross combinations were evaluated at Kalyani. CIN117 X UPC94 exhibited highest fibre yield. Fibre percentage ranged from 4.21 to 6.13 with an average of 5.12±0.58. Two best cross combinations for this trait were CIN147 X JRC321 and CIN117 X UPC94.

Sixteen crosses in the F<sub>9</sub> generation were also evaluated in micro-plot at Kalyani. The cross combination CEX045 X JRC321 exhibited highest green weight and fibre weight plant<sup>-1</sup> at Kalyani. At Coochbehar out of nine cross combinations, fibre yield of six cross combinations were found to be significantly higher than the superior check JRC 321. Out of 25 crosses of F<sub>5</sub> generation evaluated at Bahraich, CIN117 x CIN312 produced highest fibre yield.

***C. olitorius*:** F<sub>5</sub> generations of 25 crosses were evaluated at Kalyani. SKH1 X OIJ100/TAN/NY/018C was found to be most promising.

## 1.4. Performance of entries in IET and AVT

### Tossa Jute (*C. olitorius*)

**IET:** As per national average JROG-1 was the best entry followed by NOJ-27-4046 and JROG-2.

**AVT-I:** Test entry JROM-9-1 (24.43 q ha<sup>-1</sup>) was found to be the best performer followed by check variety JRO 8432 (24.36 q ha<sup>-1</sup>) and JROS 7 (24.27 q ha<sup>-1</sup>).

**AVT-II:** In 2010, JROM-1 (29.13 q ha<sup>-1</sup>) and JRO-3608 (28.44 q ha<sup>-1</sup>) were the best entries.

### White jute (*C. capsularis*)

**IET:** Test entry NDC-2014 (28.97 q ha<sup>-1</sup>) turned to be the best performer followed by NCJ-28-1 (28.71 q ha<sup>-1</sup>), UBC-1 (26.99 q ha<sup>-1</sup>), JBC-G-2 (26.76 q ha<sup>-1</sup>) and JBC-G-1 (26.58 q ha<sup>-1</sup>).

**AVT-I:** NCJ-27-40121 (25.59 q ha<sup>-1</sup>) was the highest performing entry followed by JRC-9057 (24.63 q ha<sup>-1</sup>), KJC-11 (24.02 q ha<sup>-1</sup>), JRC- 9079 (23.98 q ha<sup>-1</sup>) and JRCM-9-2 (23.55 q ha<sup>-1</sup>).

**AVT-II:** KJC-10 (23.85 q ha<sup>-1</sup>) and JRCM-2 (23.28 q ha<sup>-1</sup>) were the best entries in 2010. There was no significant difference among entries as per pooled analysis over 2009 and 2010. However, test entry KJC-9 (25.01 q ha<sup>-1</sup>) recorded highest yield followed by KJC-10 (24.76 q ha<sup>-1</sup>).

### Roselle (*H. sabdariffa*)

**IET:** At national level AHS-188 turned out to be the best performing entry and recorded 34.33 q ha<sup>-1</sup> of fibre yield followed by CRIJAFR-8 (32.14 q ha<sup>-1</sup>), CRIJAFR-7 (31.77 q ha<sup>-1</sup>) and CRIJAFR-3 (31.17 q ha<sup>-1</sup>).

**AVT-I:** Test entry JRRM-9-1 was found to be the best performer with 25.48 q ha<sup>-1</sup>, followed by AHS-169 (25.02 q ha<sup>-1</sup>).

**AVT-II:** Test entry AHS-163 recorded the highest yield (25.30 q ha<sup>-1</sup>) followed by JRR-9 (24.61 q ha<sup>-1</sup>). On the basis of pooled analysis AHS-163 recorded the highest yield (25.77 q ha<sup>-1</sup>) followed by AHS-161 with fibre yield of 25.09 q ha<sup>-1</sup>.

### **Kenaf (*H. cannabinus*)**

**IET:** Check variety AMC 108 (27.92 q ha<sup>-1</sup>) recorded highest yield followed by test entry JBM-G-1 (27.77 q ha<sup>-1</sup>) but they were not significant different to each other.

**AVT-I:** Test entry JRKM-9-1 (20.24 q ha<sup>-1</sup>) showed the best performance followed by best check AMC-108 (20.08 q ha<sup>-1</sup>).

**AVT-II:** Test entries JBM-84 (20.70 q ha<sup>-1</sup>) and JBM-81 (19.67 q ha<sup>-1</sup>) outyielded the superior check variety AMC-108 (19.57 q ha<sup>-1</sup>).

### **Sunnhemp (*Crotalaria juncea*)**

**IET:** Test entry JRJ-611 (12.85 q ha<sup>-1</sup>) identified as the best performer over the superior check K-12 (12.55 q ha<sup>-1</sup>).

**AVT-II:** In 2010 and pooled analysis over years, SH-4 was found to be the best performer (8.73 q ha<sup>-1</sup>) followed by SUN-037 (8.68 q ha<sup>-1</sup>).

### **Ramie (*B. nivea*)**

**AVT-I:** This trial was conducted only in Sorbhog, Assam. Entry R-1411 showed maximum dry fibre yield (17.40 q ha<sup>-1</sup>year<sup>-1</sup>) followed by R-67-34 (Kanai) (16.13 q ha<sup>-1</sup>year<sup>-1</sup>) and RH-1 (15.25 q ha<sup>-1</sup>year<sup>-1</sup>).

Adaptive trial was also conducted at Sorbhog centre. Highest plant height (113.67 cm) and dry fibre yield (18.08 q ha<sup>-1</sup>year<sup>-1</sup>) was recorded for test entry R-1411 followed by check R-67-34.

### **Flax (*L. usitatissimum*)**

**AVT-I:** At Barrackpore, JRF-2 (8.77 q ha<sup>-1</sup>) yielded highest fibre yield followed by FT-897 (7.55 q ha<sup>-1</sup>), JRF-3 (7.02 q ha<sup>-1</sup>) and JRF-1 (6.81 q ha<sup>-1</sup>). Entry JRF-2 was also found to be the tallest entry across locations.

## **1.5. Adaptive trials**

Adaptive trials were conducted for one *C. capsularis*, two *C. olitorius*, two *H. sabdariffa*, two *H. cannabinus* and one *B. nivea* entries with suitable varieties.

### **White Jute (*C. capsularis*)**

**KJC 7:** This variety had been in Adaptive Trial at three locations in Orissa. It outyielded national check JRC 321 by 29.50%.

### **Tossa Jute (*C. olitorius*)**

**JRO 2405:** This entry was tested in adaptive trial at three locations in West Bengal. It outyielded the national check JRO-524 by 13.15%.

**JRO 2407:** This entry was tested in adaptive trial at two locations in West Bengal and two locations in Bihar. It outyielded the national check JRO 524 by 11.18%.

### **Roselle (*H. sabdariffa*)**

**AHS 160:** This entry was tested in adaptive trial at two locations in Andhra Pradesh and two locations in Orissa. It outyielded the national check AMV 5 by 12.03%.

**JRR 07:** This entry was tested in adaptive trial at two locations in West Bengal and two locations in Orissa. It outyielded the national check AMV 5 by 20.07%.

### **Kenaf (*H. cannabinus*)**

**JBM 71:** This entry was tested in adaptive trial at one location in West Bengal and two locations in Orissa. It outyielded the national check HC 583 by 19.84%.

**JBM 75:** This entry was tested in adaptive trial at one location in West Bengal and two locations in Orissa. It outyielded the national check HC 583 by 9.97%.

## 1.6. Fibre Quality

### Tossa Jute

**IET:** BCCO-2 in Nagaon and JROG-2 in Kalyanicentre was found to be most competitive with checks in terms of fibre fineness and fibre tenacity.

**AVT-I:** Test entry JROSO4 performed best in terms of fibre tenacity and fineness among all entries and farely better than the checks.

**AVT-II:** Test variety JROM-1 found to be comparative with check varieties when compared in terms of fibre fineness and tenacity.

### White Jute

**IET:** In general, high percentage of hard root content and defects in all the samples was found. Entry UBC-2 was found to be competitive with checks for fibre quality.

**AVT-I:** Reasonably high percentage of hard root content and defects in all the samples was found. No single entry was found to be uniformly better than check variety over all locations. All the varieties were of W-5 grade.

**AVT-II:** In general, all entries were found to be weaker in fibre tenacity and ranged from grade W-4 to W-6. JRCM-2 in general showed competitive to the check variety.

### Mesta

In AVT-II trials, JBM-81 in HC mesta and JRR-9 in HS mesta showed better fibre quality in terms of tenacity and fineness over check graded in M-3 and M-2, respectively.

### Sunnhemp

Only tenacity of fibre sample was analysed and it was found that entries of Kalyanicentre performed better as compared to Rahuricentre in IET trial. In AVT-II trial, all entries showed almost similar tenacity value. There was not a single entry which performed better except SUN-037 at Rahuri and check variety SH-4 at Barrackpore.

## 2. Crop Production

Among the two new *C. olitorius* genotypes (currently under adaptive trial) tested, JRO 2405 out yielded the check variety JRO 524 at Coochbehar and Kendrapara. Maximum fibre yield of the genotypes was obtained with 100:50:50 fertilizer dose at Coochbehar and Kendrapara while at Kalyani centre fibre yield increased significantly up to 80:40:40 fertilizer dose. Similarly the new *C. capsularis* genotype (under adaptive trial) KJC 7 outyielded the check variety JRC 212 at Coochbehar. The jute genotype responded to fertilizer application upto 100:50:50 kg/ha level at Coochbehar and Bahraich while the response was up to 80:40:40 kg/ha at Nagaon.

The target yield of jute fibre (40 q/ha) was achieved within  $\pm 10\%$  of yield deviation only in Kalyani centre but the target yield of rice grain (40 q/ha) was achieved in all the centers where fertilizer was applied as per soil test basis. However, higher jute fibre yield was obtained in the treatments where fertilizer was applied as per soil test and fixed target basis than the recommended dose fertilizer application.

Integrated nutrient management as per soil test value in acidic soil revealed that target yield of jute fibre, mesta fibre and rice grain (40 q/ha) was not achieved in both Coochbehar and Amadalavasa centres but highest yield was recorded in the treatments where fertilizer was applied as per soil test values and fixed target than recommended dose of fertilizer.

Under integrated weed management programme in jute and mesta, application of herbicides followed by one hand weeding recorded lesser weed growth which finally resulted into higher fibre yield of the crops in almost all the centres. At Coochbehar and Kalyani, both the pre-emergence (Butachlor @ 2 kg a.i./ha) and post emergence herbicides (Quizalofop ethyl @ 60 g a.i./ha + sticker @ 1 ml/l at 15 DAE) followed by one hand weeding recorded higher fibre yield of jute and also effectively controlled the weeds as compared to two hand weeding and may be recommended for the regions. Similarly at Bahraich and Kendrapara, application of Quizalofop ethyl @ 60 g a.i./ha + sticker @ 1 ml/l at 15 DAE followed by one hand weeding at 15-20 days after herbicide application may be recommended as it gave better performance in terms of weed control and fibre yield of jute. In mesta, application of Butachlor @ 3 kg a.i./ha at 10 DBS followed by one hand weeding

at 15-20 DAE at Amadalavalasa and application of Quizalofop ethyl or Trifluralin followed by one hand weeding gave better weed control and fibre yield of the crop at Aduthurai and may be recommended for weed control in mesta for the region.

Maximum seed yield of jute (6.78 q/ha) at Nagaon, Assam was recorded when the crop was sown on 3rd week of July with 45 cm x 10 cm spacing. Topping at 45 DAS increased the seed yield of jute significantly over the topping at 30 DAS.

The new roselle entry AHS-160 out yielded the check variety AMV 5 at Amadalavalasa while the fibre yield of the other new roselle entry JRR 07 was statistically at par with that of check variety HS 4288 at Aduthurai. Maximum fibre yield of mesta was observed with 80:40:40 kg/ha fertilizer dose.

Both the new kenaf entries JBM- 71 and JBM- 75 (currently under adaptive trial) recorded significantly higher fibre yield over the check variety HC-583. Fibre yield increased significantly with increase in fertilizer dose up to 60:30:30 kg/ha dose only.

The pooled data of 2009 and 2010 revealed that mesta variety MT 150 recorded significantly higher green biomass (394.5 q/ha) and successive increase in nitrogen dose increased the green biomass significantly up to 100 kg N/ha beyond which the increase was not significant at Kendrapara, Amadalavalasa and Aduthurai centres.

In Kendrapara combined application of FYM (5t/ha) and nitrogenous fertilizer (40 or 60 kg/ha) applied in 2 or 3 equal split doses increased plant height and fibre yield of mesta. Application of N in 3 split doses proved to be more effective. Highest net return (Rs. 34308/ha) and benefit-cost ratio (2.38) were recorded when 60 kg N/ha was applied in 3 equal splits. In Aduthurai, application of FYM @ 5 t/ha significantly improved plant height and dry fibre yield of mesta. Significant improvement in fibre yield was recorded when 60 kg N/ha was applied in 3 equal split doses. In Amadalavalasa, incorporation of FYM significantly improved dry fibre yield of mesta. Application of 60 kg N/ha in 3 split doses improved the fibre yield significantly.

The retting of whole plants of mesta was completed within 10 days in the month of October when the newly developed CRIJAF microbial retting consortium consisting three pectinolytic bacteria (no cellulose activity but having xylanolytic activity) was used. Moreover, the mesta fibre maintained very good strength (27.7 g/tex) and fineness (2.70 tex). The same consortium when tried at farmers' field condition in Malda district for jute, retting was completed within 20 days with an improvement in the fibre quality by two grades (from TD VI to TD IV). Out of 45 bacterial isolates screened at Amadalavalasa, one *Bacillus* sp., two *Erwinia* sp. and one *Micrococci* sp. showed higher clear zone formation in the pectin agar and they may have higher pectinolytic activity. Similarly, one *Aspergillus* sp., one *Trichoderma* sp. and two *Trametes* sp. showed may have higher pectinolytic activity among the fungal isolates of Amadalavalasa. The four bacterial and four fungal isolates significantly reduced the retting duration.

Sowing mesta on 1<sup>st</sup> week of July in 30 cm x 10 cm spacing recorded highest seed yield of the crop at Aduthurai.

Seed yield of sunnhemp was maximum when the crop was sown on 20<sup>th</sup> July at Amadalavalasa. At Pratapgarh, sowing of sunnhemp on 1<sup>st</sup> August recorded maximum seed yield (12.09 q/ha) and yield attributes of the crop during 2009 which decreased significantly with further delay in sowing. Maximum seed yield of sunnhemp was observed at Pratapgarh with 30 cm x 10 cm spacing (14.74 q/ha) during 2009 and topping at 30 DAS increased the higher seed yield of the crop. At Rahuri, sowing of sunnhemp on 1<sup>st</sup> to 3<sup>rd</sup> week of July recorded maximum seed yield of the crop and further delay in sowing to middle of August significantly reduced the seed yield. Maximum seed yield (21.06 q/ha) of the crop was recorded with 30 cm x 10 cm spacing and topping done at 45 DAS.

Substitution of 25% of the recommended fertilizer dose through FYM recorded significantly higher fibre yield of ramie over 100% RDF and was statistically at par to the fibre yield obtained from 150% RDF treatment in all the cuttings at Coochbehar. At CRIJAF, substitution of 25% of the recommended fertilizer dose through organics recorded fibre yield statistically at par with 100% RDF. Moreover, 25% of N when applied through FYM recorded fibre yield statistically at par with 150% RDF at CRIJAF.

At Bamra, application of sisal waste @ 20 t/ha along with NPK @ 60:30:60 kg/ha recorded significantly highest leaf length and number of leaves/plant thereby indicating a nitrogen savings by 60 kg/ha. At Amadalavalasa, the local sisal variety recorded significantly higher number of leaves/plant and green biomass compared to hybrid sisal. Integration of organic matter in the form of vermi-compost or poultry manure

recorded significantly higher amount of green biomass or yield attributes compared to inorganic fertilizer and maximum value of these attributes were recorded in plants receiving vermi-compost (@ 2.5 t/ha) along with NPK @ 90:30:30 kg/ha.

### 3. Crop Protection

Survey and surveillance of insect pests and diseases of jute and mesta were carried out at all the AINP centres including CRIJAF, Barrackpore. The common insect pests recorded in jute were semilooper, Bihar hairy caterpillar, yellow mite, stem weevil and cockchaffer beetle. In case of diseases, stem and root rot, wilt, anthracnose, blackband and mosaic were observed in jute. Foot and stem rot, leaf rot were the major diseases in mesta. Infestation of mite was more regular where as Bihar hairy caterpillar infestation in South Bengal was too high to the extent of 100% in some places. The incidence of root rot (35%) and stem rot (34%) was maximum at Barrackpore and Katihar respectively. Stem weevil infestation was particularly high at Katihar (on *olitorious*) and Baharaich (on *capsularis*). The jute leaf mosaic was prominent in the locations of Katihar and Baharaich.

In mesta foot and stem rot and leaf rot were the major diseases with incidence of as high as 34.23% and 19.22% respectively. At Amadalavalasa, jassid, aphid, white fly, mealy bug and semilooper were the insect pest among which infestation of mealy bug was maximum.

The reaction of the 52 germplasms (different groups) evaluated against root-knot nematode at five locations was inconsistent. Seven entries were found to be highly resistant at Baharaich. The number of moderately resistant entries at Barrackpore, Kendrapara and Coochbehar was 51, 20 and 3 respectively. All the entries were rated to be either susceptible or highly susceptible against root-knot nematode at Nagaon.

*Olitorious* and *capsularis* jute germplasms were screened against major insect pests and diseases at Coochbehar, Kendrapara and Baharaich. There were few germplasms found to be free from any pest and disease infestation/infection which may be due to the resistant nature of the particular germplasm. On the basis of evaluation against foot and stem rot under sick plot condition, 11 mesta entries were rated to be highly resistant at Amadalavalasa while 11 entries were tolerant to mealy bug infestation.

Bio-efficacy of insecticides against the insect pests indicated that endosulfan (0.07%) was most effective against yellow mite, while semilooper, apion and Bihar hairy caterpillar were effectively controlled by profenophos (0.1%) while spinosad (0.015%) performed best against cockchaffer beetle.

Jute seed infection by *M. phaseolina* causing stem rot or root rot was significantly less in late sown (mid-August) seed crop than earlier sown crop. Seed yield (8-12 q/ha) and yield attributes were also high in late sown condition. One spraying of carbendazim 50 WP @ 0.1 % either at pod setting or pod maturation reduces the seed infection, discolouration and increased the seed yield.

Jute (*Olitorious*) AVT-I entry, JROS 7 suffered least from mite infestation whereas in AVT-II, except BCCO 1 other entries were at par in reaction with the check. In AVT-I and AVT-II *capsularis* group KJC 1 and KJC-9 and KJC-10 were more susceptible to stem weevil. AHS 165 roselle entry (AVT-II) was highly susceptible to foot and stem rot (*Phytophthora parasitica* var. *sabdariffa*) and AHS-161 was moderately resistant with least infection.

Five varieties, viz. JRO-2407 of tossa jute, KJC-7 of white jute, JBM-75 of kenaf, JRR-07 and AHS-160 of roselle have been identified for release. The target yield of jute fibre (40 q/ha) was achieved within  $\pm 10\%$  of yield deviation only in Kalyanicentre but the target yield of rice grain (40 q/ha) was achieved in all the centers. Retting of mesta through retting consortium was completed within 10 days in the month of October with very good strength (27.7 g/tex) and fineness (2.70 tex). Substitution of 25% of the recommended fertilizer dose through FYM recorded higher fibre yield of ramie over 100% RDF. Application of sisal waste @ 20 t/ha along with NPK @ 60:30:60 kg/ha produced maximum leaf length and leaves/plant by substituting 60 kg N<sub>2</sub>/ha. In sick plot condition, 11 mesta entries were rated to be highly resistant against foot and stem rot. Profenophos (0.1%) was effective for control of semilooper, apion and Bihar hairy caterpillar. Jute seed infection by *M. phaseolina* significantly less in late sown (mid- August) seed crop than earlier sown crop.