

## Potato production with quality seed and improved technology in Assam

**Assam is among the top 10 potato producing states of India but with very low yields due to several constraints. Utkal Tubers India Private Limited, Bengaluru conducted a trial in a farmer's field in Assam with its seed and technology during 2020-21. Average yields of two varieties (K Pukhraj and K Jyoti) was 11.62 t/acre (28.70 t/ha) and that of farmer's local variety and traditional method, it was 3.8 t/acre (9.39 t/ha). In UTIPL's case, yield is 3 times more than farmer's own case and higher than national average with further scope to increase it. The study shows that there is tremendous scope for improving the yields in Assam with improved seed and technology.**

ASSAM is in the top 10 potato producing states of India but the average yield (10.23 t/ha during 2018-19) is much below the national average (24.08 t/ha during 2018-19). Reasons/constraints for such low yields are non-availability of good quality seed, very high cost of seed and transportation if arranged from Punjab, Haryana or Uttar Pradesh, farmers' ignorance about new technology due to poor extension work, presence of bacterial wilt/brown rot (*Ralstonia solanacearum*) in soil at several places, high population of aphids and white flies transmitting virus diseases, epidemics of late blight (*Phytophthora infestans*), potato leaf roll virus disease, insect pests like cutworms (*Agrotis ipsilon*), red ants (*Dorylus* spp), potato tuber moth (*Phthorimaea operculella*), highly acidic soils, lack of storage facilities and potato being grown as rain fed crop, mainly.

Considering all these factors, Utkal Tubers India Private Limited, Bengaluru (UTIPL) conducted a trial in a farmer's field with sandy loam to silty loam soil in Manikapathar, Garmur, Majuli during autumn 2020-21

with its technology and quality seed with the objective to increase the yields. In this field trial, the farmer planted ware potato crop in 0.96 acre with UTIPL's seed and technology under their supervision and grew on his own some local red variety (name not known to him also) with traditional method in 0.50 acre in the same field adjacent to UTIPL's crop for comparison.

### Potato varieties, seed and its preparation

UTIPL provided G3 seed (size 36-45 mm) of two varieties – Kufri Pukhraj and Kufri Jyoti, 15 bags of each variety (having 50 kg seed in each bag). UTIPL's seed was treated (sprayed) with Azoxystrobin (Amistar) 0.2% solution on 25<sup>th</sup> October 2020, kept in ventilated shade for 10-12 days for proper sprouting. Actually it was to be treated with 3% solution of boric acid powder (commercial grade) but the seed when reached Assam, started chitting/slight sprouting during transportation from Punjab which was de-cold stored and dispatched on 15<sup>th</sup> October 2020.



Field showing plant emergence



Healthy crop



Completion of earthing up

### Planting

UTIPL's two varieties were planted on 3<sup>rd</sup> and 5<sup>th</sup> November 2020 while farmer's own crop on 4<sup>th</sup> November 2020 in such a way that planting time remain similar as it was not possible to plant all the crops in one day. In UTIPL's crops also, all the operations were carried out manually. Planting was done by ridges and furrows method. Well sprouted seed tubers were planted at tuber-to-tuber distance of 20 cm and row-to-row distance of 60 cm at a depth of 10-12 cm.

### Fertilizers

No green manuring / FYM application could be done. Nitrogen, phosphorous and potassium (NPK) fertilizers were applied @ 70, 69 and 60 kg/acre, respectively. Of which half dose of N (35 kg), two third dose of P (46 kg) and full dose of K (60 kg) were applied as basal dose while planting and remaining half dose of N (35 kg) and one third dose of P (23 kg) were applied at the time of earthing up after 25 days of planting. For applying above doses of NPK at planting and earthing up, following fertilizers, quantity and method were used.

*Basal:* Urea 35 kg (broadcasting 2 days before planting), DAP 100 kg and MOP 100 kg (as banding at the time of planting)

*At earthing up:* Urea 60 kg and DAP 50 kg (as banding).

Pre-/post- emergence herbicide could not be applied to check the weeds.

### Earthing up

It was done manually from 28 to 30 November 2020. Remaining doses of N and P as mentioned above were applied. Light irrigation was given on 1<sup>st</sup> and 2<sup>nd</sup> December 2020.

Comparison of the trial crops by UTIPL and the farmer in the same field are shown below. This is the growth after 4 weeks of planting. Differences in growth are clearly visible.

Officers from District Agriculture Office, Majuli, Assam visited the field on 30<sup>th</sup> November 2020 and appreciated a lot the crop stand, its health standard and the way the trial was being conducted by UTIPL.



Healthy crop

A week after earthing up and irrigation, the crop stand was very good.

A month after earthing up and irrigation, lush green healthy crop was visible in the field (4<sup>th</sup> December 2020).

### Measures to check late blight

In the region, late blight attacks the potato crop every year and therefore, prophylactic sprays of contact fungicide-Mancozeb @ 800g/acre were recommended from 2<sup>nd</sup> week of December 2020 onwards with repetitions at 8-10 days intervals. Farmer gave only two sprays of Mancozeb, first on 11<sup>th</sup> December (in time) and second on 28<sup>th</sup> December (very late). Late blight was noticed on 10<sup>th</sup> January 2021 which probably appeared a day or two earlier. Once late blight has appeared, only systemic fungicide can check further spread. Therefore, Moximate (Cymoxanil 8% + Mancozeb 64%) @ one kg /acre was sprayed on 11<sup>th</sup> January and by that time more foliage were blighted. Late blight damage / loss in tubers were also found at the time of harvesting in that part of the field. It was more in Kufri Pukhraj as compared to Kufri Jyoti.

### No use of insecticides

Being ware crop, no insecticides were applied. Some damage was caused by cutworms.

### Cracking in Kufri Jyoti tubers

In Kufri Jyoti, with the increase in tuber size, some cracking was noticed. Therefore, foliage of Kufri Jyoti was



Crop comparison

| Variety        | Area (acre) | Healthy         |                |              | Losses (kg) due to |     |        |          |       | Total production      |                |              |
|----------------|-------------|-----------------|----------------|--------------|--------------------|-----|--------|----------|-------|-----------------------|----------------|--------------|
|                |             | Production (kg) | Yield (t/acre) | Yield (t/ha) | Cut-Crack          | Rot | Rodent | Cut-worm | Total | Healthy + Losses (kg) | Yield (t/acre) | Yield (t/ha) |
| Kufri Pukh raj | 0.50        | 6900            | 13.80          | 34.09        | 1060               | 380 | 370    | 90       | 1900  | 8800                  | 17.60          | 43.47        |
| Kufri Jyoti    | 0.46        | 4250            | 9.24           | 22.82        | 880                | 210 | 230    | 80       | 1400  | 5650                  | 12.28          | 30.33        |
| Average        | 0.96        | 11150           | 11.62          | 28.70        | 1940               | 590 | 600    | 170      | 3300  | 14450                 | 15.05          | 37.17        |

cut manually with sickles on 18<sup>th</sup> January to stop further increase in tuber size. Kufri Pukhraj was left as such and the foliage dried itself at maturity.

### Harvesting, losses and reasons

Pre-harvesting test was done on 2<sup>nd</sup> February 2021 to check the tuber skin maturity. Harvesting was done manually on 3<sup>rd</sup> and 4<sup>th</sup> February 2021. Incidence of tuber-borne diseases, pest injury, etc. if any was recorded. Common scab, black scurf, russetting on tubers, red ants, Potato tuber moths, beetles, etc. were not found. Tuber rots due to late blight / soft rot, cutworm injury and rodent damage were serious problems causing heavy losses.

| Variety       | Percent losses by weight due to |      |        |          | Total |
|---------------|---------------------------------|------|--------|----------|-------|
|               | Cut-cracks                      | Rots | Rodent | Cutworms |       |
| Kufri Pukhraj | 12.0                            | 4.3  | 4.2    | 1.0      | 21.6  |
| Kufri Jyoti   | 15.6                            | 3.7  | 4.1    | 1.4      | 24.8  |
| Average       | 13.4                            | 4.1  | 4.1    | 1.2      | 22.8  |

As seen in above table, major losses were due to cut-cracks in tubers. In Kufri Pukhraj, it was only cuts (and not cracks) damaged during manual harvesting as the size of the tubers was very big. It can be reduced to minimum by taking extra care while harvesting. However, it is not the complete loss as all the partially cut tubers are used though the market value of such produce is lowered. Among the rots (4.3%), it was mainly the tubers affected by late blight which could have been avoided if prophylactic spray schedule of contact fungicide was followed sincerely. To check the rodent damage (4.2%), collective efforts of all the farmers of the area were required. Cutworm damage was 1.0% but being ware crop, no insecticide was applied to control cutworms. However, like cut tubers, such partially damaged tubers by cutworms or even rodents are used/sold at lower market price.

In case of Kufri Jyoti, cut-crack losses were very high (15.6%). Of which major losses were due to cracking. In Kufri Jyoti, cracking is a varietal character. Since it is mainly in large size tubers, cracking loss can be reduced to minimum by reducing fertilizer doses or haulm cutting at an early date say at 70 days stage thus not allowing the tubers to become very large. Here, rottage was mainly due to soft rot development in deeply cracked tubers. Rodent and cutworm damage was same as in Kufri Pukhraj.

### Yield

After thorough sorting, the actual healthy tuber yields, losses due to individual factors and possible yields without losses are given in Table 1.

Findings of this field trial revealed that even after losses due to several factors, the yields of healthy produce was quite encouraging viz. 13.80 t/acre in Kufri Pukhraj and 9.24 t/acre in Kufri Jyoti with average yield of 11.62 t/acre in two varieties. It is clear that the factors causing losses are such which can be controlled to great extent. The yields thus can be increased up to 17 t/acre in Kufri Pukhraj and 12 t/acre in Kufri Jyoti.

In case of farmer's plot, harvesting was done in parts and completed on 1<sup>st</sup> March 2021. Total production was 1900 kg (38 bags of 50 kg each) from 0.5 acre area. Thus the yield was 3.8 t/acre.

### Future scope

This trial should be repeated in larger plot (about 3 acre) and preferably at a place where mechanized farming can be done. Also effect of lime application to increase soil pH should be studied. Soil is to be tested not only for the freedom from *Ralstonia solanacearum* but also for nutrients availability to decide upon the optimum doses of fertilizers to be applied. Also, the farmer should grow the same varieties (procured from local sources) as being grown by UTIPL for better comparison.

### SUMMARY

Assam is among the top 10 potato producing states of India but yields are very low as compared to national average due to several constraints. Utkal Tubers India Private Limited, Bengaluru conducted a trial in a farmer's field in Assam with its seed and technology during 2020-21. Average yields of two varieties (Kufri Pukhraj and Kufri Jyoti) was 11.62t/acre (28.70t/ha) and that of farmer's local variety and traditional method, it was 3.8 t/acre (9.39 t/ha). In UTIPL's case, yield is 3 times more than farmer's own case and higher than national average with further scope to increase it to about 4 times of farmer's yield. The study shows that there is tremendous scope for improving the yields in Assam.

For further interaction, please write to:

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