

Paddy straw mulching: A boon for fruit crops

The burning of paddy straw due to predominance of rice crop in *kharif* season creates a huge problem of air pollution in addition to depletion of soil health. Paddy straw is available abundantly in Punjab which can be effectively utilized as surface mulch to control environmental pollution apart from offering many other benefits in fruit orchards like effective weed control, reduced fruit drop, improvement in yield and fruit quality, conservation of soil moisture, increased soil organic matter as well as improvement in soil structure. This article highlights use of optimum quantity and suitable time of applying paddy straw mulch in major fruit crops like kinnow, guava, pear, peach, ber and plum grown under subtropical climate.

IN Punjab state, nearly 22.5 million tonnes of paddy straw is produced from paddy cultivated in nearly 3 million hectares of area every year. After harvesting of rice, large amount of residue left in the field is burnt on-farm by farmers in order to clear the fields for sowing of succeeding *rabi* crop. Unlike wheat straw, it is not used as animal feed due to presence of higher silica content. Generally farmers do not incorporate rice straw in soil due to small period left for its decomposition as well as higher cost involved in its incorporation into soil.

The practice of burning rice straw causes serious air pollution in addition to degradation of soil health. It is estimated, about 40% nitrogen, 30 to 35% phosphorus, 80 to 85% potassium and 40 to 50% sulphur taken up by rice plants remains in vegetative plant parts at crop maturity which is lost from top layer of soil when rice straw is burned which results in less fertile and unviable land for agricultural crops in long run. Lot of particulate matter is also released in the atmosphere during burning of rice straw in the open fields. The high levels of PM_{2.5} and PM₁₀ in the air causes chronic diseases like respiratory diseases, cardiovascular diseases, etc and also adversely affect the health of milk producing animals.

To prevent the burning of straw, Government invokes Section 144 of the Criminal Procedure Code (CPC), but it is hardly implemented. State Governments through various departments are making efforts to educate the farmers regarding different ways and means of utilization of rice straw for its retention or incorporation or other options like as energy source, raw material for industries, prali char, compost, mulching material, mushroom cultivation, biogas generation, etc.

Under North Indian conditions, developmental phase of fruits crops like, kinnow, guava, pear, peach, plum etc. coincides with higher atmospheric temperature ($\geq 40^{\circ}\text{C}$) with low humidity in months like April to June leading to higher fruit drop and weed infestation which interferes

with productivity of fruits. Department of Fruit Science, Punjab Agricultural University, Ludhiana conducted research trials on use of paddy straw as mulch in various fruit crops. Use of paddy straw mulch in major fruit crops like kinnow, guava, pear, peach, ber and plum are recommended by Punjab Agricultural University for use in commercial orchards having subtropical climate and published in package of practices for fruits crops to educate fruit growers and farmers. Application of paddy straw mulch in orchards helps in suppressing weed growth, reduces soil surface temperature which results in reduced fruit drop, moisture conservation as well as improvement in yield and quality of fruits.

Use of paddy straw mulch in various fruit crops

Kinnow: Application of paddy straw mulch @ 3.0 tonnes/acre in kinnow orchards during April under tree canopy results in 15.6% less fruit drop, conservation of moisture during hot months (about 20% moisture saving



Use of paddy straw mulch in ber orchards



Use of paddy straw mulch in kinnow orchards

in soil upto 100 cm depth), eco-friendly weed management (44% reduction in weed biomass from June to September) and improvement in fruit quality in terms of higher total soluble solids and lower acidity. Paddy straw mulching resulted in significantly higher yields. Paddy straw mulch @ 3.0 tonnes/acre can also be applied in December end which results in significantly higher yields with 46% reduction in weed biomass.

Guava: Application of paddy straw mulch @ 40 q/acre under tree canopy after addition of recommended dose of organic manure and inorganic fertilizers in May control weeds. Incorporate the degraded mulch in the month of October along with second dose of inorganic fertilizers. Mulching also results in reduced early fruit drop as well as improves fruit yield and quality of rainy season guava crop.

Pear: Application of paddy straw mulch @ 5.5 tonnes per acre in pear orchards (10 cm thick layer of paddy straw mulch) during second week of April i.e. after second

dose of urea under the canopies of trees reduce weed population in addition to 4% increase in fruit weight and 6% increase in yield.

Ber: Application of paddy straw mulch @ 5.0 tonnes per acre under tree canopies of trees in the month of October after application of second dose of urea results in about 90% suppression of weeds in orchards in addition to increase in fruit size and plant yield. Paddy straw mulch gives yield benefit upto 8.5% and weed reduction upto 91% in ber orchards.

Peach and Plum: Application of paddy straw mulch (10 cm thick layer) @ 4.5 tonnes per acre during first week of March effectively suppress the weeds in orchards. Mulching should be done after application of second dose of inorganic fertilizers. Mulching also helps in improving fruit size and yield.

Future thrust

Paddy straw is available abundantly in Punjab which can be effectively utilized as surface mulch to control environmental pollution apart from offering many other benefits in fruit orchards. Use of paddy straw as mulch can reduce fruit drop by conserving moisture content in soil and effectively manage weeds in eco-friendly manner. Moreover application of paddy straw mulch has potential to improve yield and quality of fruit crops thereby increasing market returns of fruit growers.

For further interaction, please write to:

Harismat Kaur (Senior Scientist), Department of Fruit Science, Punjab Agricultural University, Ludhiana (Punjab). *Corresponding author email: harsimratpau@pau.edu

Tractor operated horizontal shredder for orchards

A tractor operated Phule horizontal shredder for grape vineyards/ orchards was developed. It is useful for shredding of pruned material in grape vineyard and orchards and spreading it evenly on the beds of orchard. The shredded material discharged on both sides. The effective field capacity of the machine was 0.47 ha/h. The net saving of money by using the machine over traditional method is ₹2,888/ha (72%).



Tractor operated hydro-mechanically controlled offset orchard manager

The tractor operated Phule hydro-mechanically controlled offset orchard manager was developed to break beds in between the inter spaces of adjacent trees in orchards besides cutting of old roots that help in new root formation and facilitate proper aeration to root zone of the trees. When sensor rod touches the trunk of tree, it retracts and after wrap up action around tree trunk, it is extended due to hydraulic relief valves. During this process cycle of retraction and extension, the rear mounted plough bottom breaks the bed between interspaces in adjacent trees facilitating aeration to the root zone as well as simultaneously cutting old roots for enhanced growth of trees with application of manure for soil enrichment. The effective field capacity of the machine was 0.127 ha/h. Net saving by using the machine over traditional method was worked out to be ₹3,910.00/ha (48%).

Source: ICAR Annual Report 2021-22