

EFFECT OF BLACK POLYTHENE MULCH ALONG WITH IRRIGATION ON PRE-HARVEST FRUIT DROP IN PLUM (*Prunus salicina* L) CV. SATLUJ PURPLE

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ABSTRACT: The present investigation on “Effect of black polythene mulch along with irrigation on pre-harvest fruit drop in plum (*Prunus salicina* L.) cv. Satluj Purple” was carried out during 2004 and 2005 at Punjab Agricultural University, Ludhiana. The trees were irrigated at an interval of 3, 5 and 7 days starting from first week of April to the first week of May. Mulching with black polythene and transparent polythene was also done along with irrigation. Black polythene along with irrigation at 5 days interval was the most effective treatment to reduce the pre-harvest fruit drop. The fruit retention (20.74 and 19.84%), yield (14.33 and 13.55 kg/tree), fruit weight (38.52 and 39.15g), TSS (13.55 and 13.67%), TSS/acid ratio (13.29 and 13.27), nitrogen content (2.37 and 2.40%) and carbohydrate content in leaves (9.62 and 10.38%) were also the highest in this treatment. The next best treatment was black polythene mulching and irrigation at 3 days interval. Black polythene delayed fruit maturity by 1-2 days whereas transparent polythene advanced it.

Keywords : Plum, pre-harvest fruit drop, irrigation, black polythene, transparent polythene.

Plum is an important stone fruit grown in temperate zones of the world. Its importance as a fruit is almost next to apple in Europe. In Punjab, Satluj Purple, an exotic cultivar of plum is grown, as the fruits of this cultivar are larger in size and also of better quality. However, the major hindrance in increasing the area under this cultivar is its low yield at harvest due to high rate of pre-mature fruit drop. Fruit retention by the tree, and the growth and development of these fruits are influenced by internal factors, adverse climatic conditions, moisture stress and lack of nutrients. Irrigation plays an important role in improving the fruit set and yield (Purushotham and Narasinitam, 7). Net CO₂ assimilation rate was reduced by about 50 and 80 per cent under the moderate and severe drought, respectively in lychee (Roe *et al.* 8). Prolonged drought stress can induce fruit abscission in pecan, suggesting that the fruit drop is sensitive to water stress (Sparks, 10). Yang *et al.* (12) reported that fruit drop and leaf fall was promoted by water stress in apple trees. Uses of mulches conserve soil moisture, increase fruit yield and fruit weight. So the present studies were conducted to find out the effect of cultural practices on pre-harvest fruit drop in plum cv. Satluj Purple.

MATERIALS AND METHODS

The experiment was conducted on 6-years old trees, planted at 3m × 1.5m apart during 2004 and 2005 in the department of Fruit Science, PAU, Ludhiana. The plants were selected on the basis of uniform size, age and vigour. Experimental plants received uniform irrigation, manuring, fertilization, plant

protection measures and other cultural operations during the study. The layout was randomized design due to homogeneity in plant material. There were nine treatments with three replications and one tree per replication. The fruit trees were given the following treatments, starting from first week of April.

T ₁	Irrigation at 3 days interval
T ₂	Irrigation at 5 days interval
T ₃	Irrigation at 7 days interval
T ₄	Black polythene + Irrigation at 3 days interval
T ₅	Black polythene + Irrigation at 5 days interval
T ₆	Black polythene + Irrigation at 7 days interval
T ₇	Transparent polythene + Irrigation at 3 days interval
T ₈	Transparent polythene + Irrigation at 5 days interval
T ₉	Transparent polythene + Irrigation at 7 days interval

Per cent cumulative periodic fruit drop was calculated by tagging eight branches in all directions and by making subsequent counts of the fruits at weekly intervals starting from the fruit set stage. Per cent fruit retention was the total number of fruits left on tagged shoots after physiological drop and just before harvest. Fruit maturity was recorded when 75 per cent of the fruits showed change in colour from green to bright crimson. Fruit yield per tree was calculated by multiplying the number of fruits and mean fruit weight. The fruits were harvested at the optimum stage of maturity and analyzed for physico-chemical characteristics as per standard methods. TSS of the fruits was determined with the help of hand refractometer at room temperature. TSS/acid ratio was

calculated by dividing the total soluble solids with that of corresponding titratable acidity. Nitrogen and carbohydrate content was analyzed from the leaves collected from middle of the current season shoots in May. Nitrogen was estimated by micro-Kjeldahl's method (AOAC, 1) and carbohydrates as described by Ketuki (5).

RESULTS AND DISCUSSION

In 2004 and 2005 (Table 1), fruit drop was minimum (79.26 and 80.16% respectively) and fruit

retention was maximum (20.74 and 19.84%) with Black polythene and irrigation at 5 days interval (T₅) followed by Black polythene and irrigation at 3 days interval (T₄) and Transparent polythene and irrigation at 3 days interval (T₇). The maximum fruit drop (87.73 and 92.25%) and minimum fruit retention (12.27 and 7.75%) was recorded with irrigation at 7 days interval (T₃). Pre-harvest fruit drop (Table 1) was minimum (22.74 and 23.74%) in Black polythene and irrigation at 5 days interval (T₅) in the years 2004 and 2005,

Table 1 : Effect of black polythene mulch along with irrigation on pre-harvest fruit drop and fruit retention in Satluj Purple plum

Treatment	2004			2005		
	Total fruit drop (%)	Pre-harvest fruit drop (%)	Fruit retention (%)	Total fruit drop (%)	Pre-harvest fruit drop (%)	Fruit retention (%)
T ₁	81.45	29.50	18.55	82.75	34.18	17.25
T ₂	81.37	28.65	18.63	83.73	34.73	16.27
T ₃	87.73	52.10	12.27	92.25	68.08	7.75
T ₄	80.39	26.19	19.61	82.39	29.54	17.61
T ₅	79.26	22.74	20.74	80.16	23.74	19.84
T ₆	86.41	45.10	13.59	87.02	43.84	12.98
T ₇	80.65	25.76	19.35	81.16	27.06	18.84
T ₈	85.11	38.39	14.89	86.44	43.18	13.56
T ₉	85.48	44.82	14.52	86.73	42.15	13.27
CD (P=0.05)	4.12	15.59	4.12	3.51	14.38	3.51

Table 2 : Effect of black polythene mulch along with irrigation on fruit yield, fruit weight, fruit maturity, TSS and TSS/acid ratio in Satluj Purple plum.

Treatment	Fruit yield (kg/tree)		Fruit weight (g)		Fruit maturity (days)		TSS (%)		TSS/acid Ratio	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
T ₁	12.03	11.95	32.87	33.01	82.3	82.7	12.80	13.07	13.06	12.94
T ₂	12.43	11.98	27.62	29.00	82.0	83.0	12.57	12.30	12.95	12.95
T ₃	7.15	5.85	26.99	28.55	82.0	82.3	12.10	12.20	12.74	12.84
T ₄	12.78	11.28	35.22	35.81	83.0	83.3	13.10	13.10	12.97	13.10
T ₅	14.33	13.55	38.52	39.15	83.7	83.7	13.55	13.67	13.29	13.27
T ₆	8.98	7.50	31.20	32.05	83.0	83.7	12.73	13.03	12.99	12.90
T ₇	12.65	12.02	35.94	36.53	81.7	81.7	13.25	13.23	12.99	13.23
T ₈	9.89	8.97	26.95	28.04	81.0	81.3	11.03	11.23	12.83	12.77
T ₉	9.54	8.44	26.64	27.85	81.3	81.7	10.85	11.10	12.62	12.47
CD (P=0.05)	1.93	1.29	1.27	1.64	1.09	1.10	0.30	0.32	0.33	0.37

Table 3 : Effect of black polythene mulch along with irrigation on nitrogen and carbohydrate content of leaves in Satluj Purple plum.

Treatment	Nitrogen (%)		Carbohydrate (%)	
	2004	2005	2004	2005
T ₁	2.36	2.36	7.70	07.88
T ₂	2.30	2.29	7.60	07.62
T ₃	2.20	2.20	6.92	06.53
T ₄	2.21	2.22	8.37	10.35
T ₅	2.37	2.40	9.62	10.38
T ₆	2.21	2.22	7.76	09.93
T ₇	2.22	2.21	9.44	10.09
T ₈	2.21	2.22	8.03	08.52
T ₉	2.23	2.22	7.37	07.45
CD (P=0.05)	0.04	0.05	0.04	0.04

Table 4 : Relationship between fruit yield and physico-chemical characters of fruits.

Traits	Fruit Retention	Fruit weight	C/N ratio (leaves)
Fruit Yield (2004)	0.989*	0.761*	0.649
Fruit Yield (2005)	0.935*	0.706*	0.336

*Significant at 5 per cent level of significance

respectively. The maximum pre-harvest fruit drop (52.10 and 68.08%) was recorded with irrigation at 7 days interval (T₃). The results are in agreement with the findings of Thakur *et al.* (11) who recorded the lowest fruit drop with Black polythene in apples and Hayes (4) who recorded prevention of fruit drop with irrigation. The fruit yield was the highest (14.33 and 13.55 kg/tree) with Black polythene and irrigation at 5 days interval (T₅) in the year 2004 and 2005, respectively (Table 2). The yield in T₅ was the highest due to less fruit drop, better fruit retention and fruit weight. The yield was significantly less (7.15 and 5.85 kg/tree) with irrigation at 7 days interval (T₃). Thakur *et al.* (11) and Mukherjee *et al.* (6) also reported increased yield in apples and ber, respectively with black polythene mulch. Battilani (2) reported that irrigation significantly increased the yield in plum by producing larger number of fruits and higher average fruit weight. The fruit weight (Table 2) was maximum (38.52 and 39.15g) with Black polythene and irrigation at 5 days interval (T₅) which was significantly higher than other treatments. Fruit weight was minimum

(26.64 and 27.85 g) with Transparent polythene and irrigation at 7 days interval. The results are in consonant with Thakur *et al.* (11) and Singh *et al.* (9) who recorded the highest fruit weight with polythene in apple cv. Red Delicious and Strawberry, respectively.

Black polythene was found to delay fruit maturity by 1-2 days whereas transparent polythene advanced it (Table 2). Fruit maturity was the earliest (81.0 and 81.3 days) with transparent polythene and irrigation at 5 days interval (T₈). TSS (Table 2) was found to be significantly higher (13.55 and 13.67%) with Black polythene and irrigation at 5 days interval (T₅) and minimum (10.85 and 11.10%) with Transparent polythene and irrigation at 7 days interval (T₉). TSS/acid ratio (Table 2) was maximum (13.29 and 13.27) in T₅ and minimum (12.62 and 12.47) in T₉.

The highest nitrogen (2.37 and 2.40%) and carbohydrate content (9.62 and 10.38%) were recorded with black polythene and irrigation at 5 days interval (T₅) in the years 2004 and 2005, respectively (Table 3). Minimum nitrogen (2.20 % in both years) and carbohydrate (6.92 and 6.53%) contents were recorded with irrigation at 7 days interval (T₃). Ghali and Nakhlla (3) also reported increased N content in plums with black polythene mulch.

The fruit yield was significantly and positively correlated with the fruit retention and fruit weight. However, the C/N ratio of leaves showed non-significant positive correlation with the fruit yield (Table 4).

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