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Short Communication

Floral biology of some European and Japanese plum cultivars for phenological properties grown under temperate conditions of Kashmir

Insha Majid*, Aroosa Khalil, Shaila Din, Nowsheen Nazir, F.A. Khan and Fouzea Nisar*****

Division of Fruit Science, SKUAST-K, Srinagar 190025, J&K

ABSTRACT

The studies on the floral biology of some European and Japanese plum cultivars for phenological characteristics were conducted in Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar, Kashmir during the year 2016-17. The present study consisted of six plum cultivars viz. Burbank, Stanley, Friar, Wickson, Santa Rosa and Satsuma of uniform age replicated thrice in a Randomized Complete Block Design (RCBD). In the experimental year, swollen bud, bud burst, green cluster, white bud, initial bloom, full bloom, blooming period and petal fall were determined in terms of days after reference date (DARD). The data recorded revealed that the swollen bud and bud burst stage was recorded first in cultivar Satsuma (22.66 DARD and 28.33 DARD) which was statistically at par with Friar (22.67 DARD and 28.57 DARD) and late in cultivar Stanley (33.00 DARD and 51.67 DARD) respectively. The green cluster stage was observed earliest in cultivar Friar (40.33 DARD), while the earliest white bud stage was recorded in cultivar Satsuma (51.67 DARD). The initial bloom (54.23 DARD) and full bloom (59.53 DARD) was recorded earliest in cultivar Friar which was statistically at par with Satsuma, while as late green cluster (57.20 DARD), white bud (68.33 DARD), initial bloom (72.43 DARD) and full bloom (75.43 DARD) stage was recorded in cultivar Stanley. The petal fall was found earliest in cultivar Satsuma (67.23 DARD) and late in cultivar Stanley (80.23 DARD) respectively. The study concluded on the note that cultivars Satsuma and Friar were earliest to bloom and Stanley was late to bloom.

Key words: *Prunus* spp., floral biology, phenological characteristics.

Plums (*Prunus* spp.) are by far the most diverse of all the *Prunus* species and could be the most diverse of all deciduous fruit crop species which belongs to genus *Prunus* of sub family Prunoideae (*Amygdaloideae*) and family Rosaceae. The commercially grown cultivars belong to two species i.e. *Prunus domestica* L. (European plum) and *Prunus salicina* L. (Japanese plum), the former is hexaploid (2n = 6x = 48) and the latter is diploid (2n = 2x = 16). The European group of plum is native to areas between Black Sea and Caspian Sea and the adjoining areas of Persia and Asia Minor whereas the Japanese group of plum is native to China but was domesticated in Japan and subsequently was introduced to different parts of world. Although in India, plum was first introduced in 1870 by Alexander Counts at Mashobra (Shimla) in Himachal Pradesh but it was commercialized by Prof. W B Hodgson from Florida at Fruit Farm Kandaghat or erstwhile Patiala state in 1935 (now District Solan Himachal Pradesh), thereafter grown in the hilly regions of Jammu and Kashmir, Uttarakhand, Uttar Pradesh and Tamil Nadu. European plum thrives best at 1300-2000 m above mean sea level and requires about 1000-1200 chilling hours (below 7.2°C) during winter to break the dormancy whereas Japanese plum thrives well at an elevation of 1000-1600m above mean sea level and requires 700-1000 chilling hours (below 7.2°C). Plum of Kashmir has good fruit quality in comparison with other commercially growing states in India. It needs less care due to its hardy nature, enabling it to flourish well even in inferior soils where other fruits fail to grow. The trees of plum have wide range of adaptability to soil and climatic conditions. This study was carried out to evaluate the phenological characters of different plum cultivars under Kashmir conditions. The purpose of this study was to determine the early, mid and late varieties of plum based on their flowering stages so as to reduce risks and prevent spring frost damages, expand harvest time and increase the supply of fresh fruit to market, early, medium and late plum cultivars can be grown considering climatic conditions in that areas.

The present investigation was carried out in the orchard of Division of Fruit Science, Sher-e-Kashmir University of Agricultural Science and Technology, Shalimar, Srinagar, Kashmir in the year 2017. Bearing plum trees of different cultivars of uniform age (4 years old), rootstock (seedling rootstock), vigor, health, bearing and agronomical practices were selected for the trial. The trees were planted in square system of planting and maintained under uniform cultural

*Corresponding author's E-mail: inshashah011@gmail.com
**Division of Basic Science and Humanity
***Division of Vegetable Science

practices as per package and practices followed during the period of study. Six cultivars of plum viz, Burbank, Stanley, Friar, Wickson, Santa Rosa and Satsuma were investigated. Among six cultivars, four cultivars (Burbank, Friar, Santa Rosa and Satsuma) were Japanese plums and two (Stanley and Wickson) were European plums. The experimental design was randomized complete block design (RCBD). Each treatment comprised of a single plant and was replicated three times. The study focused on different phenological stages viz., (i) Swollen bud, (ii) Bud burst, (iii) Green cluster, (iv) White bud, (v) Initial bloom, (vi) Full bloom, (vii) Blooming period and (viii) Petal fall (Plate 1, 1 to 8). Date of swollen bud stage was recorded when 50 % of terminal buds were swollen and bud scale split, exposing the green colour of the leaves. Bud burst stage was recorded when fruit buds were broken at tip, showing tips of blossom buds. Green cluster stage was recorded when blossom buds were green, mostly separated in the cluster and stems lengthened. White bud stage was recorded when blossom buds were white, separated in the cluster and stems lengthened. Initial bloom stage was recorded when 10 per cent flower had opened. Full bloom stage was recorded on the date when 80 per cent of flowers had opened. The number of days taken from the date of initial bloom to the date of full bloom gives the blooming period. Petal fall stage was recorded when the experimental trees exhibited 75 per cent of the petal fall. The dates thus recorded were converted to days after reference date (DARD) fixed arbitrary as 1 Feb.

The data pertaining to phenological characteristics are presented in Table-1 and Plate 2. Among the cultivars, Satsuma was the earliest cultivar to reach swollen bud (22.66 DARD) and bud burst (28.33 DARD) stage which was statistically at par with cultivar Friar (22.67 DARD and 28.57 DARD). Cultivar Burbank (25.67 DARD) was statistically at par with Santa Rosa (26.66 DARD) followed by Wickson (28.00 DARD), whereas cultivar Stanley took maximum number of days to reach swollen bud stage (33.00 DARD). The earliest green cluster stage was recorded in cultivar Friar (40.33 DARD) which was statistically at par with cultivar Satsuma (41.00 DARD) which in turn was statistically at par with cultivars Burbank (41.47 DARD) and Santa Rosa (42.67 DARD) followed by Wickson (45.00 DARD). Stanley took maximum number of days to reach green cluster stage (57.20 DARD). White bud stage was found earliest in cultivar Satsuma (51.67 DARD) which was statistically at par with cultivar Friar (53.40 DARD) followed by Santa Rosa (54.33 DARD), Wickson (56.00 DARD) and Burbank (56.27 DARD), while as white bud stage was found late in cultivar Stanley (68.33 DARD). Initial and full bloom stage was found earliest in cultivar Friar (54.23 DARD and 59.53 DARD) which was statistically at par with cultivar Satsuma (54.33 DARD and 60.67 DARD) followed by Wickson (57.30 DARD and 61.00 DARD), Santa Rosa (58.37 DARD and 64.47 DARD) and Burbank (60.00 DARD and 63.57 DARD), whereas late initial and final bloom stage was found in cultivar Stanley (72.43 DARD and 75.43 DARD) respectively.

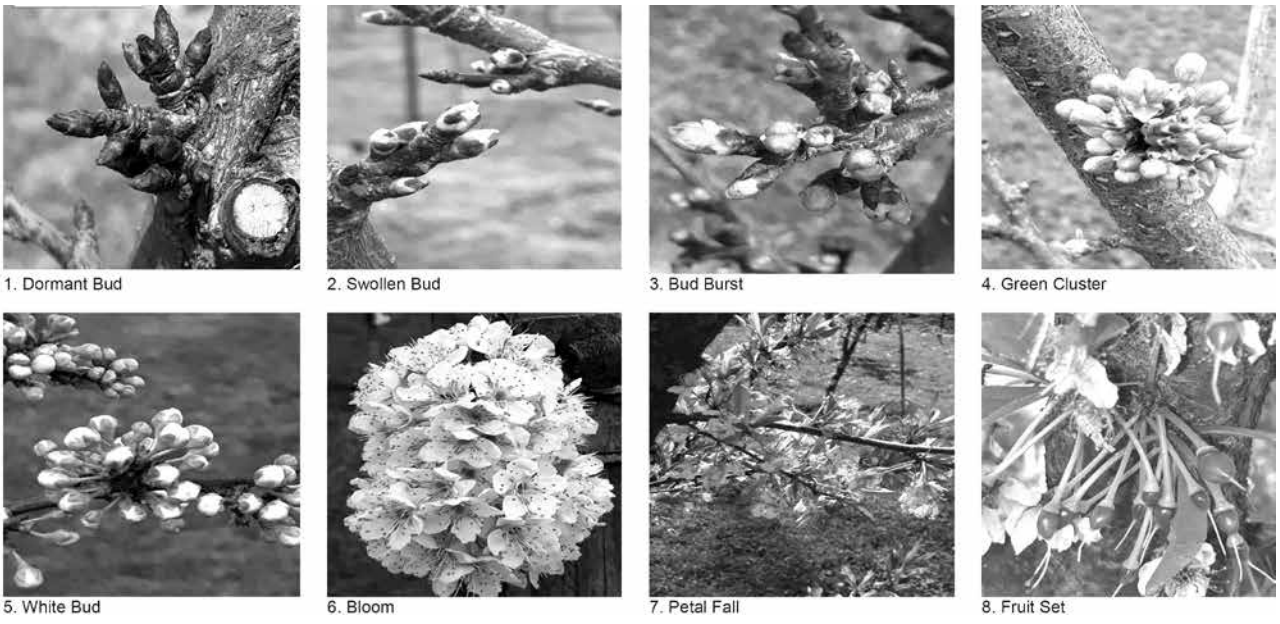
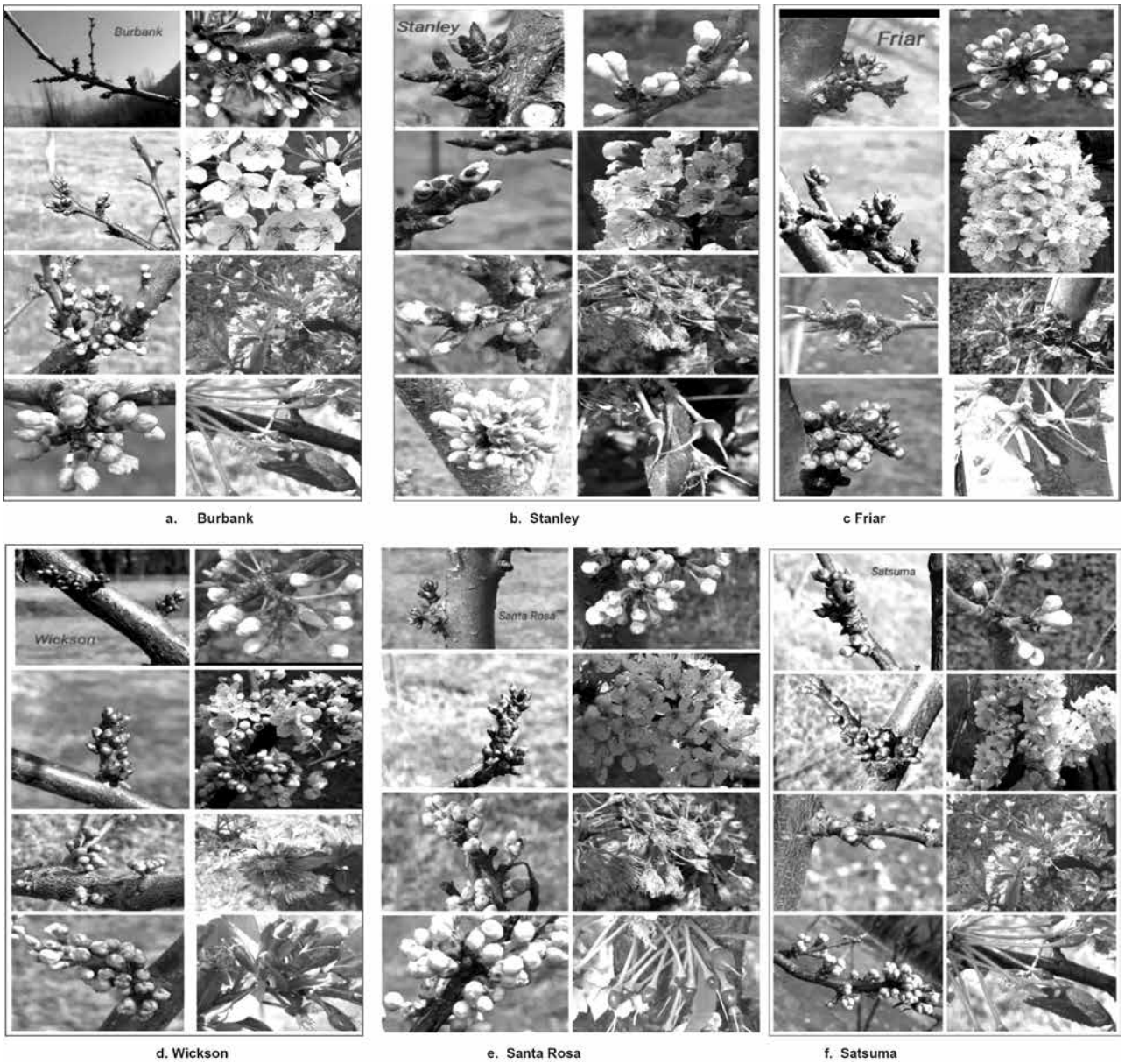


Plate. 1. Floral phenological stages in plum used for observation.



a. Burbank b. Stanley c Friar

d. Wickson e. Santa Rosa f. Satsuma

Plate. 2. Floral phenological stages of different plum cultivars.

Table 1. Floral biology of different plum cultivars.

Parameters / Cultivars	Swollen Bud (DARD)	Bud Burst (DARD)	Green Cluster (DARD)	White Bud (DARD)	Initial Bloom (DARD)	Full Bloom (DARD)	Blooming Period (days)	Petal Fall (DARD)
Burbank	25.67	33.00	41.47	56.27	60.00	63.57	3.27	70.86
Stanley	33.00	51.67	57.20	68.33	72.43	75.43	3.73	80.23
Friar	22.67	28.57	40.33	53.40	54.23	59.53	4.87	68.00
Wickson	28.00	34.00	45.00	56.00	57.30	61.00	4.21	68.10
Santa Rosa	26.66	31.00	42.67	54.33	58.37	64.47	5.97	69.77
Satsuma	22.66	28.33	41.00	51.67	54.33	60.67	4.13	67.23
CD (P≤0.05)	1.414	1.863	2.065	2.154	1.602	1.737	1.116	1.682

Maximum blooming period (5.97 days) was recorded in cultivar Santa Rosa which was statistically at par with Friar (4.87 days). Cultivar Wickson (4.21 days) was statistically at par with Satsuma (4.13 days). The least blooming period of 3.27 days were recorded in cultivar Burbank which was statistically at par with Stanley (3.73 days). Earliest petal fall stage was found in cultivar Satsuma (67.23 DARD) which was statistically at par with Friar (68.00) and Wickson (68.10) which in turn was statistically at par with Santa Rosa (69.77 DARD). Petal fall stage was found late in cultivar Stanley (80.23 DARD).

The similar variation for phenological stages was also observed by Milosevic and Milosevic (6), Kumar *et al*. (3) and Sundouri *et al.* (7) in plum cultivars. These stages can vary from year to year depending on tree health, chilling hours and environmental conditions of the area viz. air temperature, day length, altitude, rainfall etc. (Matta *et al.,* 5 and Liverani *et al.,*4). Cosmulescu *et al.* (2) stated that 'flowering time' is a feature which is influenced by climatic factor as well as genetic factor. Flowering period ranged from 3 to 6 days and differed among cultivars. These results are in agreement with those of Caliskan *et al.* (1) who studied 15 plum cultivars at Erdemli, Turkey.

From the present study, it can be concluded that cultivars Satsuma and Friar were earliest to bloom and Stanley was late to bloom. The delay in blooming time ensures a better fruit set because they can escape from bad weather conditions and undergoes the usual pollination and fertilization process.

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