A Description of Amelanchier Species in Regard to Cultivar Development*

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Nearly two dozen species of *Amelanchier* have been discovered in North America, Europe, North Africa, and Eastern Asia. One or more species have been found in every Canadian province and every state of the United States. Because of its widespread occurrence, almost totally in the wild, many names have been attached to this genus. Some of the more common names used locally are serviceberry, sarvis, maycherry, juneberry, shadblow, saskatoon, sugar pear, lancewood, boxwood, Canadian medlar, bilberry, snowy mespilus, and many others (7).

This fruit is presently in the minor fruit category, that is, fruits that are not important in the fruit industry. However, the blueberry was also included in this category until Dr. F. V. Coville took an interest in it and developed it into a fruit that is now the basis of a prosperous industry. One of the drawbacks to blueberry production in the Great Plains region is its requirement for an acid soil. It also lacks complete winter hardiness. The *Amelanchier*, on the other hand, grows well in high lime soils and is hardy farther north than the blueberry. Breeding work by Harris (4) at the Beaverlodge station, Alberta, Canada, has shown a possibility for future commercial production of this fruit.

The purpose of this paper is to assemble and compare the various species' characteristics and to relate these to approaches which can be used in breeding programs.

History

In the new world the Indians were the first to make use of the *Amelanchier* fruit, as it was one of the constituents of pemican. The berries were stirred into a boiling mixture of pulverized deer or buffalo meat, cooled, and molded into cakes. *Amelanchier* was also popular with members of the Lewis and Clark expedition who relied heavily on its fruit when their food supply was low (7). Early settlers used this fruit for preserves and pies, adding a little lemon or rhubarb juice to improve its mild flavor. It is still a popular fruit today for those who know where it is found in the wild. Birds, especially robins, take delight in it also, and will quickly strip a tree of its tasty fruit (9).

Taxonomy

The genus *Amelanchier* belongs to the family Rosaceae, subfamily Pomoideae. Its showy flowers lend it well to landscape purposes. According to Jones (7) members of this genus are "slender, often scaly barked shrubs or small trees with unarmed branches and slender terete branchlets—leaves simple, deciduous, alternate—serrate or entire—flowers perfect, regular, entomophilous in racemes terminating short leafy branchlets, opening shortly in advance of the foliage, or as the leaves unfold—calyx 5-lobed—petals 5, white or rarely pink —stamens 10-20 short—styles 2-5, free or united at the base or to the middle; carpels 2-5—each locule 2 ovuled, but in fruit nearly divided by a false partition growing from the back of each carpel—carpel walls of firm texture, not bony; pome small, mealy or juicy, berry-like, edible but often insipid."

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Table I. Common Synonyms for *Amelanchier* Species.

Species	Synonyms
1. alnifolia (Nuttall)	
2. amabilis (Wieg.)	sanguinea (Jones)
3. arborea (Michx. f.)	
4. bartramiana (Tausch.) M. Roemer	
5. basalticola (Piper)	
6. canadensis (L.) Medic	intermedia (Spach.)
7. cusickii (Wieg.)	
8. fernaldii (Wieg.)	
9. florida (Lindl.)	alnifolia var. typica (Nutt.) alnifolia var. florida (Schneid)
10. gaspensis (Wieg.)	
11. humilis (Wieg.)	spicata (Jones)
12. huronensis (Wieg.	sanguinea (Jones)
13. interior (Niel.)	intermedia (Niel.) wiegandii (Niel.)
14. intermedia (Spach.	canadensis (Jones)
15. laevis (Wieg.)	
16. lucida (Fern.)	may be stolonifera or spicata
17. mucronata (Niel.)	spicata (Jones)
18. nantucketensis (Bickn.)	canadensis (Jones)
19. neglecta (Egglest.	
20. obovalis (Michx.)	stolonifera (Wieg)
21. pallida (Greene)	alnifolia (Different Vars.)
22. pumila (Nutt.)	
23. sanguinea (Pursh.) DC	spicata (Lam.) K. Koch huronensis (Wieg.)
24. spicata (Lam.) K. Koch	intermedia (Blanchard) humilis (Wieg.) stolonifera (Wieg.) mucronata (Niel.)
25. stolonifera (Wieg.)	spicata (Jones)
26. utahensis (Koehne)	pallida var. arguta (Greene) alnifolia (Different Vars.)
27. wiegandii (Niel.	interior (Jones)

One of the distinctions of *Amelanchier* is its racemose inflorescence and carpels with a false partition growing from the back.

Pomoideae have a basic chromosome number of 17, most being diploids, with some tetraploids resulting from interspecific crosses. Cruise (2) and Jones (7) list *A. grangiflora* Rehd. as one such hybrid.

Identification of different species is quite difficult, as specimens vary greatly in different environments and also at different stages of growth. Foliage characteristics are known to vary more within certain species than between species. In light of these difficulties, Jones (7) maintains that the best basis for identification is flower morphology. Specifically this would take into account the carpel number, length and degree of fusion of the styles, pubescence of the ovary top, stamen number, petal shape and size, calyx lobe shape, size, and direction of growth, and the character of the inflorescence. Jones (7) has developed a key to the American species.

Species Description

In general, this genus has not been subjected to a great deal of research; consequently, there is quite a little disagreement as to which species are true species, which are hybrids, and which are varieties of a common species. On the whole, species described by Fernald (3), Nielson (8), and Jones (7) matched up rather well; but a few difficulties were encountered. In table I, the authority for each species described in this paper is given, plus some of the more common synonyms for each. In most cases where a detailed description was found of a synonym which varied from the basonym, it was listed as a separate species. All species described as major species by Fernald (3), Nielsen (8), and Jones (7) were considered separate species.

In table II, characteristics of each species are given so the reader may become familiar with each. Since these were compiled from the three above mentioned authors, there was disagreement, at times, as to certain characteristics of a species, such as the habitat of *A. canadensis* L. In this case, however, since all other factors were in relatively close agreement, it may be assumed either that *A. canadensis* is adaptable to a wide range of sites, probably varying with the cli-

mate, or that one of the authors did not observe a large enough population to make an accurate report. In most cases a discrepancy is interpreted as indicating a broad range of that character.

From table II we see that there is a range in height from about one foot to over 30 feet. There is quite a little variation in growth habit and amount of suckering. The habitat ranges from wet to dry and from non-calcareous to highly calcareous soils. Many species are found in dry, rocky areas, indicating possible drought resistance. All species have a racemose inflorescence with the exception of *A. bartramiana* Tauseh., and *A. pallida* Greene which have a corymbose raceme. There is variation among inflorescences from loose to dense, few flowered to many flowered, and short racemes to long. Blossoming and ripening dates cannot be relied upon too heavily, as these are the dates at which each species blooms and matures in its particular locality. All of these species would have to be grown in the same area to show the variation of these characters. Fruit size varies from 5 mm to 13 or 15 mm in three species. Harris (4) has developed fruit to 16 mm in the cultivar 'Forestburg'. The most common fruit color is dark purple. Some species produce fruit with bloom, which is good for retaining moisture. Seed size may detract from dessert appeal, since most of the seeds are rather large; but hopefully fruit can be developed with smaller or softer seeds that would be less noticeable.

Many different characteristics are present in *Amelanchier* species, some probably resulting from environmental differences, but many showing definite genetic variations. Good qualities are available for commercial uses, and more may show up when various crosses are made and plants are placed under closer observation. There is no indication of high acidity in the fruits, but descriptions of fruit quality are very brief, so this observation could have been omitted.

Breeding and Culture

The most recent *Amelanchier* breeding has been accomplished by Harris (4) from the research station at Beaverlodge, Alberta, Canada. Four introductions from that station are:

'Ataglow': White fruited variety with a columnar form, reaching a height of 18 feet. Used for ornamental purposes.

'Forestburg': Large fruited variety (⅝ inch fruit) of satisfactory growth.

'Pembina': Large, fleshy, full flavored, sweet fruit produced in long clusters. Upright, slightly spreading, vigorous bush reaching 10 feet and producing few suckers.

'Smoky': Large, fleshy, unusually sweet, mild flavored fruit. Bush is spreading, reaching a height of 6-8 feet. Produces root sprouts freely.

Harris (4) reports that the fruit ripens evenly so that the whole crop may be havested at one time. With proper management, yields of over six tons per acre may be realized. Fruit can be harvested with a hand operated vibrator that is used for picking blueberries (4).

Earlier work by Harris (4) on propagation techniques showed that hardwood cuttings will not root, but root cuttings will. Softwood cuttings rooted under mist if taken from May 27 to June 26. Rooting varied from 13 to 40 percent. Bottom heat did not increase rooting, but did extend the time during which softwood cuttings could be taken. More cuttings rooted if dipped into 0.3 percent IBA (5).

Hilton *et al.* (6) reported that 70 percent seed germination could be obtained by scarification in concentrated H_2SO_4 for 15 minutes, followed by 120 days of stratification at 2° C. Stratification of seeds in the check plot under the same conditions, but without scarification, resulted in 50 percent germination.

Table II. Characteristics of *Amelanchier* Species.

Species	Height (Meters)	Growth Habit	Plant Habitat
alnifolia	1-3(7)	stoloniferous, colonial	Plains, thickets, R. banks
arborea	5-20	Fastigiate shrub, tree	Woods, slopes, open areas
bartramiana	0.5-2.5	Fastigiate shrub	Bob borders, mt. slopes
basalticola	1-3	Shrub	Basaltic cliffs and ledges
canadensis	5-10	Fastigiate, few stems	Swamps, dry hillsides*
cusickii	1-3	Slender branches, shrub	Basaltic ledges, R. banks
fernaldii	0.3-1	Stolonifirous	Wet woods, calciphile
florida	1-5(12)	Tree, erect branches	Open woods, hillsides
gaspensis	0.3-0.9	Dense, suckering, colonial	Cliffs, ledges, shores
humilis	0.3-8	Stiff, stoloniferous	Rocky shore; calciphile
huronensis	3-7	Fastigiate shrub, tree	Calcar. cliffs, woods, shores
interior	10	Non stoloniferous straggly shrub, tree	Hillsides, stream banks
intermedia	8(?)	Tall, fastigiate	Bog, marsh margins
laevis	13	Fastigiate, irregular, branching	Dry thickets, swamp borders
mucronata	1	Stoloniferous	Basic woods; calciphile
neglecta	1-3	Slender stemmed shrub	Burned woods, damp thickets
obovalis	0.2-1.5	Slender, stoloniferous shrub	Sandy pine barrens, lowlands
pallida	1-3(8)	Erect-divaricate branching	Gravelly ridges, rocky woods
pumila	1-3	Shrub	Mt. ridges, plains
sanguinea	1-3	Few stems, ascending to straggly	Dry ridges, banks; neutral pH
spicata	0.3-2	Suckering, colonial	Gravelly shores, lime, cliffs
stolonifera	0.3-1.5	Stiff, upright, stoloniferous	Dry, acid rocks; calciphobe
utahensis	0.5-5	Clumped, much branched	Rocky slopes, deserts, banks
Wiegandii	3-5	Arching shrub	Rocky slopes, banks

*Fernald (3) and Jones (7) agree to a swampy habitat. Nielsen (8) found it growing on dry hillsides in Minnesota.

	FLOWER CHARACTERISTICS		
Species	Raceme length (cm)	Raceme habit	Flowers per raceme
alnifolia	1.5-3	Erect, dense	5-15
arborea	4-10	Spreading, pendulous	4-10
bartramiana		Corymbose	2-3
basalticola	2-4	Terminal	4-8
canadensis	2-5	Dense, nodding	
cusickii	3-5		3-8
fernaldii	2-4	Lax, spreading	3-8
florida	4-8	Erect	5-15
gaspensis	3-6	Erect, ascending	5-15
humilis	2-5	Terminal and lateral erect	
huronensis	4-7.5	Loose	Many
interior	3-6	Loose, nodding	7-12
intermedia	2-5	Erect, compact	Few
laevis	3-7(-12)	Drooping	Many
mucronata	3-5	Strict, dense	
neglecta	2-4	Erect	7-10
obovalis	1-3	Dense	4-10
pallida	2-4	Somewhat corymbose	4-6

Table II. (Continued).

Species	Raceme length (cm)	Raceme habit	Flowers per raceme
pumila	2-4		4-8
sanguinea	4-7	Loose	4-10
spicata	1.5-4	Erect, dense	4-10
stolonifera	1.5-4	Erect, dense	
utahensis	2-3		3-6
wiegandii	5.5-7.5	Loose, pendulous	6-12

	FRUIT CHARACTERISTICS			
Species	Size (mm)	Color	Quality	Seed Size (mm)
alnifolia	8-11(-15)	Purple, glaucous-glabrous	V. sweet, juicy	5x3
arborea	6-10	Reddish purple	Dry, insipid	4.5x3
bartramiana	10-13	Purplish-black	Insipid	4.5x3
basalticola	9-12	Dark purple, glabrous	Juicy	6x3.5
canadensis	7-10	Red purplish-black	Insipid	5x3
cusickii	10	Bluish-black	Juicy, edible	5x(?)
fernaldii	6-10	Purplish-black, glabrous	Juicy	5x2.5
florida	10-13	Purplish-black	Juicy, edible	5x2
gaspensis	8-10	Publish-black, glabrous, glaucous	Juicy, sweet	5x3
humilis		Black, glaucous	Juicy, sweet	
huronensis	5-8	Dark purple	V. sweet, juicy	
interior	6-8	Purplish black	Juicy, sweet	5x3
intermedia		Dark purple	Juicy, sweet	
laevis	6-8	Dark purplish-black, glaucous	Juicy, sweet	4.5x2.5
mucronata				
neglecta	8-10	Purplish-black	Juicy	5x ?
obovalis	6-8	Purplish-black, glabrous	Juicy, sweet	5x2.5
pallida	4-6	Purplish-black	Juicy	
pumila	8-9	Dark purplish, glaucous	Juicy	5x ?
sanguinea	6-8	Dark purplish-black	V. sweet, juicy	5x3
spicata	6-8	Purplish-black	Juicy, sweet	5x3
stolonifera		Blackish	Juicy, sweet	
utahensis	6-10	Purplish-black	Dry up on bush	6x3
wiegandii	7-8	Purplish-black	Juicy, sweet	

Objectives for a Breeding Program

Because of the similarity of *Amelanchier* to the blueberry in fruit and vegetative characters, the breeding procedures could follow the pattern of Coville (1) who began selecting *Vaccinium* species which had desirable characteristics in the wild, and through interspecific hybridization, evaluation, and selection released many superior varieties. Fruit size was increased from a little over one-half inch to over an inch. Many more characters have been bred into the blueberry; and from these we can gain an idea of what to look for in setting up a breeding program for *Amelanchier*. Since little work has been done on this genus, many goals may be set up. Some of these are:

Large fruit that has small or soft seeds and retains its flavor well through processing; easily picked or shaken loose; small dry scar; bright color with bloom; firm, durable with non-cracking skin and a small calyx;

variation in ripening among varieties as well as uniformity of ripening within varieties; late blooming; hardy; productive; short stature (below 6 feet); drought resistant; adaptable to high lime soils; and resistant to diseases.

In table III species have been arranged in order of their tendancy to express certain desired characteristics such as low stature, large fruit size, etc. This may be used as a quick reference for determining which species would be the best to use for obtaining certain desired characters. It should be pointed out that while categories in each column are arranged in decreasing order, species within each category are not, since most of them

Table III. Qualitative Arrangement of *Amelanchier* Species.

Height	Habit	Habitat	
Under 1 M	**Fastigiate**	**Dry, Rocky**	**Calciphile**
mucronata	huronensis	sanguinea	huronensis
fernaldii	humilis	stolonifera	humilis
gaspensis	stolonifera	wiegandii	mucronata
	canadensis	pallida	fernaldii
1-2 M	intermedia	arborea	spicata
stolonifera	laevis	gaspensis	gaspensis
spicata	bartramiana	obovalis	intermedia
obovalis	pallida	basalticola	
	florida	utahensis	**Calciphobe**
2-3 M	arborea	huronensis	stolonifera
sanguinea	obovalis		obovalis (?)
bartramiana		**Banks, Shores**	canadensis (?)
pumila	**Arching**	alnifolia	
neglecta	sanguinea	sanguinea	**Swamps, Bogs**
cusickii	wiegandii	huronensis	intermedia
basalticola	cusickii	wiegandii	laevis
(alnifolia)		humilis	bartramiana
(pallida)	**Straggling**	gaspensis	fernaldii
	interior	fernaldii	
3-5 M	fernaldii	interior	
humilis		laevis	
wiegandii	**Non stoloniferous**	bartramiana	
florida	interior	spicata	
utahensis		utahensis	
	Stoloniferous		
5-8 M	alnifolia		
alnifolia	humilis		
huronensis	mucronata		
pallida	gaspensis		
humilis	stolonifera		
	fernaldii		
5-10 M	obovalis		
canadensis	spicata		
interior			
Over 10 M			
laevis			
arborea			

Table III. (Continued).

Raceme Length	Flowers per Raceme	Raceme Type
Over 10 cm	**15-11**	**Loose**
laevis	alnifolia	sanguinea
	interior	huronensis
10-6 cm	gaspensis	wiegandii
sanguinea	florida	interior
huronensis	wiegandii	arborea
wiegandii	huronensis (many)	
interior	laevis (many)	**Dense**
laevis		alnifolia
arborea	**10-7**	stolonifera
gaspensis	sanguinea	mucronata
florida	pumila	canadensis
	fernaldii	intermedia
5-4 cm	neglecta	spicata
sanguinea	arborea	obovalis
huronensis	spicata	
stolonifera	cusickii	
canadensis	obovalis	
intermedia	basalticola	
interior		
laevis	**6-3**	
arborea	pallida	
gaspensis	utahensis	
cusickii	bartramiana	
florida		
	Few	
4-2 cm	intermedia	
alnifolia pallida		
humilis pumila		
stolonifera fernaldii		
canadensis neglecta		
intermedia spicata		
interior		

have a range of variance for each characteristic. For example, in the fruit size column, all four species in the first category should be considered equal in their expression of fruit size, and also, all nine species in the 10-9 mm category should be considered the same. In cases where species overlapped two categories, they were included in both. For more specific characteristics the reader should refer back to table II.

Summary

The genus *Amelanchier* occurs throughout the United States and parts of Canada and is known by many names. About 24 species have been described by various authors. There are many variations among these species, several of which would lend themselves well to commercial production. Recent work at the Beaverlodge Research Station, Alberta, Canada, has resulted in the release of four varieties superior to the wild species. Good yields are possible with proper management. This fruit could be grown in calcareous upland soils of the Great Plains where blueberries cannot be grown without soil modification.

Table III. (Continued).

Fruit Size	Fruit Quality	Fruit Color	Seed Size
Over 11 mm	**Very Sweet**	**Purple**	**Under 5 mm**
alnifolia	alnifolia	alnifolia	laevis
florida	sanguinea	huronensis	bartramiana
basalticola	huronensis	canadensis	arborea
bartramiana		intermedia	
	Sweet	arborea	**5 mm**
10-9 mm	humilis	pumila	alnifolia
canadensis	stolonifera		sanguinea
bartramiana	wiegandii	**Purple-black**	canadensis
pumila	intermedia	wiegandii	interior
fernaldii	interior	interior	pumila
neglecta	laevis	bartramiana	fernaldii
arborea	spicata	pallida	neglecta
gaspensis	obovalis	neglecta	spicata
utahensis	gaspensis	fernaldii	gaspensis
cusickii		spicata	cusickii
	Bland	gaspensis	florida
8-6 mm	basalticola	florida	obovalis
sanguinea	fernaldii	cusickii	
huronensis	neglecta	obovalis	**6 mm**
wiegandii	pallida	basalticola	basalticola
interior	pumila	utahensis	
laevis	cusickii		
fernaldii	florida	**Black**	
arborea		sanguinea	
spicata	**Insipid**	humilis	
obovalis	canadensis	stolonifera	
utahensis	arborea	laevis	
	bartramiana		
Under 6 mm	utahensis	**Bloomy**	
pallida		alnifolia (some)	
		humilis	
		laevis	
		pumila	
		gaspensis (some)	

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