Discussion Group: Rootstocks of Choice

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The discussion group on "Rootstocks of Choice", Friday, 15 Oct. 1999, discussed several things over the two time periods; however, the connecting theme was conifer grafting. This article, therefore, focuses primarily on conifers with some mention of *Salix*. Some general discussions regarding the effects of understocks are also included. Table 1 is a list of conifers and their rootstocks of choice.

Grafting is a technique used to unite "parts" of different plants by bringing the cambium of each into contact and then creating a situation under which the cut surfaces can unite and grow together (Macdonald, 1986). Grafting is the main reason so many unique conifers with unusual forms can be offered in today's retail market. Conifer grafting usually involves bench grafting. Bench grafting covers grafting and budding techniques completed inside a covered structure, normally a shed or greenhouse (Macdonald, 1986). The type of bench grafting most often used on conifers is the side veneer graft. Side veneer grafts are also used for *Abies, Acer, Alnus, Betula, Picea, Pinus*, as well as the other conifers listed in the table below.

ROOTSTOCK EFFECTS

Rootstock or understock is the lower part of the graft. It usually possesses a root system that will support the subsequent shoot development from the scion (Macdonald, 1986). The scion is the part of the graft that will provide the new shoot system. Roots, unlike tops of plants, have no distinct period of dormancy and are able

Table 1. Listed are some of the rootstocks discussed by the groups that conifer and *Salix* growers in the Pacific Northwest have found best for the scion materials indicated.

Scion	Understock
Abies alba 'Compacta'	*Abies grandis* or *A. procera*
Abies alba 'Pendula'	" "
Abies alba 'Pyramidalis'	" "
Cedrus libani subsp. *atlantica* 'Aurea robusta'	*Cedrus deodara*
Cedrus deodara 'Golden Horizon'	"
Cedrus deodara 'Kashmir'	"
Chamaecyparis obtusa 'Gracilis'	*Thuja occidentalis* 'Smaragd'
Chamaecyparis obtusa 'Nana Gracilis'	"
Juniperus squamata 'Blue Star'-std.[X]	*Juniperus scopulorum* 'Skyrocket'
Juniperus squamata 'Blue Carpet' - std.	"
Juniperus squamata 'Holger' - std.	"
Juniperus conferta 'Sea Green' - std.	"
Picea abies 'Acrocona'	*Picea abies* or *Picea glauca*

Picea abies 'Little Gem' - std.	"
Picea abies 'Nidiformis' – std.	"
Picea abies f. *pendula*	"
Picea abies pendula - std.	"
Picea abies 'Willy Klippert'	"
Picea glauca 'Little Globe'	"
Picea glauca 'Golden Harber'	"
Picea pungens 'Bakeri'	"
Picea pungens 'Baby Blueeyes'	"
Picea pungens 'Iseli Fastigiate'	"
Picea pungens 'Nana'	"
Picea pungens 'Nana' std.	"
Pinus aristata 'Sherwood Compact'	*Pinus strobus*
Pinus bungeana	*Pinus slyvestris*
Pinus cembra 'Glauca'	*Pinus strobus*
Pinus cembra 'Landis'	*Pinus strobus*
Pinus coulteri	*Pinus sylvestris*
Pinus contorta 'Spaan's Dwarf'	*Pinus sylvestris*
Pinus densiflora 'Pendula'	"
Pinus densiflora 'Tanyo-sho' & std.	"
Pinus flexilis 'Vanderwolf's Pyramid'	*Pinus strobus* and *P. flexilis*
Pinus flexilis 'Glauca Pendula'	" "
Pinus heldreichii var. *leucodermis* 'Compact Gem'	*Pinus sylvestris*
Pinus mugo - std.	"
Pinus mugo 'Aurea'	"
Pinus mugo 'Aurea' - std.	"
Pinus mugo 'Mops'	"
Pinus mugo 'Mops' - std.	"
Pinus mugo 'Prostrata'	"
Pinus mugo 'Prostrata' - std.	"
Pinus nigra 'Hornibrookiana'	"
Pinus nigra compact green form	"
Pinus strobus 'Blue Shag'	"
Pinus strobus 'Contorta'	" or *P.koraiensis*
Pinus strobus 'Fastigiata'	"
Pinus strobus 'Horsford Nana'	"
Pinus strobus 'Horsford Nana'- std.	"
Pinus strobus 'Pendula'	"
Pinus strobus 'White Mountain'	"
Pinus strobus 'White Tip'	"
Pinus sylvestris 'Beacon Hill'	*Pinus sylvestris*
Salix caprea 'Weeping Sally' (syn. 'Pendula') - std.	*Salix ×stipularis* (syn. *S. smithiana*)
Salix caprea 'Weeping Sally' - 41 std.	*Salix ×stipularis*
Salix fargesii	*Salix ×stipularis*
Salix integra 'Hakuro-nishiki'- std.	*Salix ×stipularis*
Salix integra 'Hakuro-nishiki' - 2411 std.	*Salix ×stipularis*
Salix integra 'Hakuro-nishiki' - 41 std.	*Salix ×stipularis*
Salix magnifica	*Salix ×stipularis*
Salix purpurea 'Nana' - std.	*Salix ×stipularis*
Salix purpurea 'Nana' - 2411 std.	*Salix ×stipularis*

[x] std = standard

to grow whenever temperatures, moisture, and other conditions are favorable (Westwood, 1978). The root system therefore can have a tremendous impact on the plants overall health and quality. Rootstocks, in fruit tree and ornamental production, are selected for their ability to increase stress tolerance, including cold, drought, heat, flooding, and/or salt stress. In the area of cold stress, rootstocks can have several effects including influence on chilling requirements. Chilling requirements in turn affect flowering and time of propagation (Kester, pers. commun. 1999). Rootstocks are also selected for their ability to impart resistance to pests including insects and diseases. An example of this would be in choosing an understock for five-needle pines such as *Pinus strobus*. The understock for *P. strobus* cultivars was always *P. strobus* but now *P. koraiensis* is used because *P. strobus* is so susceptible to root rot. Rootstock choice can also influence the root anchorage ability. Some understocks can provide better root architecture for certain locations such as street plantings. Dave Burger is examining these root architecture differences at the University of California, Davis. Rootstocks can be selected for reducing suckering, increasing tolerance to different soil conditions and types, and increasing tree performance including vigor and nutrient utilization. Rootstocks are also selected for ease of propagation and graft compatibility.

TIMING

Most nurseries start conifer grafting in early December with *Thuja* and *Sequoia* cultivars. *Thuja* and *Sequoia* cultivars should be finished before any heavy frosts occur. Heavy frosts may lead to tissue damage. Tissue damage, if it occurs, can result in poor graft unions and low growing percentages. In early January, five-needle pines are grafted. After the five-needle pines, grafting priorities are set by which understock is in the best condition in terms of its root development. To determine the condition of the understock, signs of budding out or breaking dormancy are observed.