Increasingly, growers must aim to produce both higher quality and greater quantity of fruit to cover their overhead costs and turn their orchard into a successful investment as quickly as possible. Clearly, to have a successful orchard, it is important to start with quality nursery stock that is certified virus-free. It is not advisable to acquire stock without this certification, as there is a high risk of orchard failure due to viruses and diseases commonly present in non-certified propagation material. The soil type and growing conditions, as well as the choice of the rootstock most suitable for the selected scion cultivar, are the most important initial considerations for the grower preparing for a new orchard.

**ROOTSTOCK**

The choice of rootstock depends not only on soil conditions and graft affinity but also on the desired model of production. There are two factors of which the importance cannot be ignored:

- graft affinity with the selected cultivar
- soil conditions (pH, active lime, physical composition).

Underestimating these factors often means planting an orchard that will have a short life and be unable to generate income as planned.

**Quince:**

**MC:** selected at the East Malling (England) experimental station as EMC. Superficial root system, limited soil exploration, poor tree anchorage; reduces tree vigour, induces early bearing, high productivity and yield; high quality fruit. Susceptible to ferric chlorosis, to cold and to drought, but resistant to pear decline and to nematodes. Recommended for high or super-high density orchards in fertile, irrigated soils with low active lime (4-5%). Not advisable in clay or waterlogged soils. Excellent graft affinity with Conference and Decana del Comizio, good affinity with Abate Fétel but better with an intermediate stock. With Conference it is important to thin adequately in order to achieve good fruit size. Not recommended for William or Kaiser.

**BA29:** clonal selection of quince from Provence by the INRA experimental station at Angers (France). Root system fine and branched, less sensitive than other quinces to active lime (max 6-7%), good anchorage, suitable for dry soils through it prefers deep cool soils. Trees on this rootstock are uniform, with large fruit of good quality. Can have trouble getting established post-transplanting under non-ideal soil conditions (rough soil texture, poorly worked soil, drought, etc.). Poor affinity or unfavourable soil conditions
can produce non-homogeneous orchards with physiological reddening towards the end of the summer. Affinity with Abate Fétel is good, also good for Conference and Decana del Comizio. Kaiser and William intermediate stocks are used.

**SYDO**: clonal selection of Angers quince obtained by the INRA experimental station at Angers (France). Root system fibrous, of medium size, sensitive to drought and to active lime (4-5%), good resistance to viruses. Trees on this stock are homogeneous, of vigour intermediate between MC and BA29, with early bearing and good yield efficiency, large flavourful fruit. Good affinity with Abate Fétel, Conference, Decana del Comizio, but with Kaiser and William an interstock is necessary.

**Adams**: Dutch clonal selection of Angers quince similar to MC, root system fibrous, of medium size, induces medium-low vigour, early bearing, high productivity and yield. Good fruit size, requires fertile, cool, irrigated soils, does not tolerate active lime.

**EMH* (QR 193-16)**: The most recent selection by the Horticultural Research International of East Malling (England). Vigour intermediate between MC and MA, does not produce suckers, entrance into production comparable to Sydo. The literature describes compatibility with Conference and Decana del
Comizio, recent field experience has shown good affinity also with Abate Fétél. Fruit obtained are of good quality and excellent size.

**MA:** clonal selection of Angers quince selected in East Malling, characterised by good rooting ability, resistance to nematodes, to the wooly apple aphid and to pear decline. Suitable for heavy soils, requires irrigation, not tolerant of active lime (max 5%), susceptible to cold. Induces moderate or medium-low vigour, high productivity and yield efficiency, good fruit quality and early bearing.

**CTS 212:** clonal selection by the University of Pisa from seedlings of an MA quince x fruiting quince cross. Induces medium-low vigour, good productivity, early bearing and good fruit size. Tolerates active lime (up to 8%). Graft affinity with Abate Fétél and Kaiser not satisfactory, adaptable to all soil types if irrigated, requires irrigation, not tolerant of replanting pear-on-pear.

**Seedling:**

**COMMON SEEDLING:** generally obtained from seeds of varieties used for cider or seeds of William used in commercial processing. Deep and well-developed root system but non-homogeneous early growth. Suited to almost all soil types, tolerates active lime, drought resistant, sensitive to waterlogging.

Good affinity with all cultivars but induces high vigour and late entrance into production; fruit size is usually smaller than that obtained on quince stock. It is recommended for Kaiser and William as an alternative to quince with an interstock.

**SEEDLING SELECTIONS FROM THE FAROLD® SERIES®:** clonal selections obtained from seedlings of an Old Home x Farmingdale cross. Initially sold as OH x F, the Farold® series was introduced in the early 1990s. Of this series the most interesting are Farold®40 and Farold®69.

**Farold®40 Daygon:** tolerant of pear decline, recommended for soils that are neither heavy nor waterlogged, with irrigation, good tolerance to active lime. Bearing age is between that of common seedling and that of quince.

**Farold®69 Daymir:** characteristics similar to Farold®40 but with slightly less vigour, good affinity with Abate and William.

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**Harvest calendar for pears (in the region of Emilia-Romagna, Italy)**

<table>
<thead>
<tr>
<th>Variety</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>TURANDOT</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
<tr>
<td>CARMEN</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
<tr>
<td>COSCIA</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
<tr>
<td>S. MARIA</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
<tr>
<td>B.C. WILLIAMS (from August 5th through 15th)</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
<tr>
<td>MAX RED BARTLETT</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
<td>☀️</td>
</tr>
</tbody>
</table>

---

Spindle
Both are suitable for medium-density orchards (palmette and variants), requires long pruning to have enough fruiting to suppress excess vigour. All Farold® are resistant to Erwinia amylovora.

SEEDLING SELECTIONS IN THE FOX SERIES: obtained from the old pear variety Volpina, selected by the Dipartimento di Colture Arboree of the University of Bologna.

FOX 9: Origin: DCA Bologna. Proprietor: Universities of Milan, Bologna and Azienda Regionale Veneto. Induces intermediate vigour, slightly more than BA29; extensive root system gives good tree anchorage. The canopy is balanced, with early bearing as in BA29. Non-suckering, very tough, adapts to clay soils, sub-alkalinity, active lime. Excellent performance in terms of yield with Abate Fétel, William and Conference. Yield efficiency and fruit quality similar to that obtained with BA29. The propagation of Fox 9 takes place in the Propagation Center of Vivai Fratelli Zanzi, which holds exclusive international rights to market this rootstock.

### VARIETIES

#### ABATE FÉTEL

**Origin:** France, of uncertain parentage, known since 1876.

**Tree:** medium vigour, and poor affinity with quince; high productivity is consistent if properly pruned

**Fruit:** large size, curved, elongated shape; thin yellowish-green skin with russetting; flesh is white, juicy, melting, sweet and flavourful.

**Overall:** the most common cultivar in Italy, in demand for export due to large size, flavour and storage potential

#### CARMEN*

**Origin:** Lorenzo Rivalta, Istituto Sperimentale per la Frutticoltura, Forlì station (Italy). Cross of Dr Guyot x Bella di Giuigno, released in 1999.

**Proprietor:** CRA-FRF, Forlì, Italy

**Tree:** high vigour, good affinity with quince; highly productive.

**Fruit:** large, elongated bottle-shape; smooth yellow-green skin with russetting; flesh is yellowish-white juicy, sweet, melting, aromatic and of excellent flavour

**Overall:** of interest for early bearing and high yield. Fruit are very attractive and of high quality, resistant to excessive textural loss.

#### CONFERENCE

**Origin:** England. Free pollination of Léon Leclerc de Laval, known since 1885.

**Tree:** medium-low vigour with good affinity with quince; early bearing, productivity high and consistent over time due to parthenocarpy.

**Fruit:** medium size, slender, pear-shaped; yellowish-green skin with russetting, flesh is yellowish-white juicy, sweet, melting, aromatic and of excellent flavour

**Overall:** of interest for excellent flavour and for good storage potential (up to 180-210 days with modified atmosphere). In over-ripe fruit the flesh texture tends to collapse easily.

#### COSCIA

**Origin:** central Italy, of uncertain parentage, known since 1800.

**Tree:** high vigour and good affinity with quince, susceptible to scab, of average entrance into production, high and consistent yield.

**Fruit:** medium size, elongated pear-shape, bright yellow skin without russetting, slight pink blush on sun-exposed side, white fine-textured juicy flesh with excellent flavour.

**Overall:** of interest for yield, flavour, storage potential, suitable for growing in southern areas.

### VARIETIES AND THEIR POLLINIZERS

<table>
<thead>
<tr>
<th>EARLY SUMMER VARIETIES</th>
<th>POLLINIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turandot*</td>
<td>Coscia e Tosca</td>
</tr>
<tr>
<td>Carmen*</td>
<td>Conference, Tosca*, Norma*, William</td>
</tr>
<tr>
<td>Coscia</td>
<td>Coscia Precoce, Bella di Giuigno, Spadona</td>
</tr>
<tr>
<td>Santa Maria</td>
<td>Abate Fétel, Coscia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUMMER VARIETIES</th>
<th>POLLINIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>William</td>
<td>Conference, Kaiser, Decana del Comizio, Passacrassana</td>
</tr>
<tr>
<td>Max Red Bartlett</td>
<td>Conference, Decana del Comizio, Kaiser, Passacrassana</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AUTUMN-WINTER VARIETIES</th>
<th>POLLINIZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference</td>
<td>William, Decana del Comizio, Kaiser, Passacrassana</td>
</tr>
<tr>
<td>Abate Fétel</td>
<td>Carmen, Coscia, Decana del Comizio, Conference, William, Passacrassana</td>
</tr>
<tr>
<td>Decana del Comizio</td>
<td>William, Conference, Passacrassana</td>
</tr>
<tr>
<td>Passacrassana</td>
<td>Decana del Comizio, William, Conference, Abate Fétel</td>
</tr>
<tr>
<td>Rosada</td>
<td>Abate Fétel, William, Conference</td>
</tr>
<tr>
<td>Forelle</td>
<td>Abate Fétel, William</td>
</tr>
</tbody>
</table>
Synonyms: Coscia di Firenze, S. Cristoforo, Ercolini.

**DECANA DEL COMIZIO**

*Origin*: France, of uncertain parentage, known since 1849.

*Tree*: very vigorous, good affinity with quince, productivity medium and alternate. It is advisable to use weak quince rootstocks (MC).

*Fruit*: large, teardrop-shaped, thin yellowish-green skin, slightly reddened by the sun, flesh of medium consistency and excellent flavour, but sensitive to handling and bruising; must be harvested and transported with care.

*Synonyms*: Comice, Fondante du Comice, Beurré Robert.

*Overall*: successful in all zones of Italy, of interest for fruit size and organoleptic qualities, stores well.

**FORELLE**

*Origin*: old German variety from the late 1600s

*Tree*: high vigour, consistent production, fruits mainly on spurs and short shoots.

*Fruit*: medium size (145 g), oval, smooth yellowish skin covered with abundant lenticels, with red patches where exposed to sun, white fine-textured flesh, compact, sweet, acidic, scented, pleasant flavour.

*Overall*: of interest for organoleptic qualities, in need of evaluation of storage potential.

**KAISER (BOSCH)**

*Origin*: France, of uncertain parentage, known since 1830.

*Tree*: high vigour and poor affinity with quince; very productive, fruits mainly on spurs.

*Fruit*: large size, elongated bottle- or pear-shape; bronze russetted skin on yellow background, flesh of medium texture and excellent flavour, sweet and aromatic.

*Overall*: of interest for quality, appearance and storage potential of the fruit. Common in northern Italy.

*Synonyms*: Imperatore Alessandro, Kaiser Alessandro, Beurré Bosc.

Tab. 1 - Tree spacing and recommended rootstocks for Abate Fétel

<table>
<thead>
<tr>
<th>ROOTSTOCK</th>
<th>TRAINING SYSTEM</th>
<th>DISTANCES (m)</th>
<th>TREES PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC</td>
<td>Vertical cordon</td>
<td>3-3,2</td>
<td>0,3-0,5</td>
</tr>
<tr>
<td>SIDO®</td>
<td>Spindle</td>
<td>3,5-3,7</td>
<td>0,7-1</td>
</tr>
<tr>
<td>BA29</td>
<td>Palmette or Trellised-Y</td>
<td>3,3-3,7</td>
<td>1-1,2</td>
</tr>
<tr>
<td>ADAMS</td>
<td>Spindle</td>
<td>3,3-3,5</td>
<td>0,6-0,8</td>
</tr>
<tr>
<td>EMH</td>
<td>Palmette or Trellised-Y</td>
<td>3,3-3,7</td>
<td>1-1,2</td>
</tr>
<tr>
<td>FOX 9</td>
<td>Spindle</td>
<td>3,5-3,8</td>
<td>0,8-1</td>
</tr>
<tr>
<td></td>
<td>Palmette or Trellised-Y</td>
<td>3,5-3,8</td>
<td>1-1,2</td>
</tr>
</tbody>
</table>

Tab. 2 - Tree spacing and recommended rootstocks for William

<table>
<thead>
<tr>
<th>ROOTSTOCK</th>
<th>TRAINING SYSTEM</th>
<th>DISTANCES (m)</th>
<th>TREES PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIDO® BA29</td>
<td>Spindle</td>
<td>3,5-3,7</td>
<td>0,7-1</td>
</tr>
<tr>
<td>intermediate</td>
<td>Palmette or Trellised-Y</td>
<td>3,3-3,7</td>
<td>1-1,2</td>
</tr>
<tr>
<td>seedling</td>
<td>Spindle</td>
<td>3,8-4</td>
<td>1-1,2</td>
</tr>
<tr>
<td>FAROLD 40</td>
<td>Palmette or Trellised-Y</td>
<td>3,8-4</td>
<td>1-1,2</td>
</tr>
<tr>
<td>FOX 9</td>
<td>Spindle</td>
<td>3,5-3,8</td>
<td>0,8-1</td>
</tr>
<tr>
<td></td>
<td>Palmette or Trellised-Y</td>
<td>3,5-3,8</td>
<td>1-1,2</td>
</tr>
</tbody>
</table>

Tab. 3 - Tree spacing and recommended rootstocks for Kaiser

<table>
<thead>
<tr>
<th>ROOTSTOCK</th>
<th>TRAINING SYSTEM</th>
<th>DISTANCES (m)</th>
<th>TREES PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIDO® BA29</td>
<td>Spindle</td>
<td>3,5-3,7</td>
<td>0,7-1</td>
</tr>
<tr>
<td>intermediate</td>
<td>Palmette or Trellised-Y</td>
<td>3,3-3,7</td>
<td>1-1,2</td>
</tr>
<tr>
<td>seedling</td>
<td>Spindle</td>
<td>3,8-4</td>
<td>1-1,2</td>
</tr>
<tr>
<td>FAROLD 40</td>
<td>Palmette or Trellised-Y</td>
<td>3,8-4</td>
<td>1-1,2</td>
</tr>
<tr>
<td>FOX 9</td>
<td>Spindle</td>
<td>3,5-3,8</td>
<td>0,8-1</td>
</tr>
<tr>
<td></td>
<td>Palmette or Trellised-Y</td>
<td>3,5-3,8</td>
<td>1-1,2</td>
</tr>
</tbody>
</table>

Tab. 4 - Tree spacing and recommended rootstocks for Conference

<table>
<thead>
<tr>
<th>ROOTSTOCK</th>
<th>TRAINING SYSTEM</th>
<th>DISTANCES (m)</th>
<th>TREES PER HECTARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC</td>
<td>Vertical cordon</td>
<td>3-3,2</td>
<td>0,3-0,5</td>
</tr>
<tr>
<td>SIDO®</td>
<td>Spindle</td>
<td>3,5-3,7</td>
<td>0,7-1</td>
</tr>
<tr>
<td>BA29</td>
<td>Palmette or Trellised-Y</td>
<td>3,3-3,7</td>
<td>1-1,2</td>
</tr>
<tr>
<td>FOX 9</td>
<td>Spindle</td>
<td>3,5-3,8</td>
<td>0,8-1</td>
</tr>
<tr>
<td></td>
<td>Palmette or Trellised-Y</td>
<td>3,5-3,8</td>
<td>1-1,2</td>
</tr>
</tbody>
</table>

**MAX RED BARTLETT**

*Origin*: USA. Bud mutation of William (Bartlett), released in 1945.

*Tree*: medium-low vigour and poor affinity with quince; medium-high productivity, upright growth, tendency to regression of fruit colour.

*Fruit*: medium-large size, quince-shaped, yellow skin with brick red blush over 50-60% of the surface, fine-textured white juicy flesh, excellent flavour.

*Overall*: good quality but stores less well than William, particularly...
SANTA MARIA
**Origin:** Alessandro Morettini, University of Florence, cross of William and Coscia, released in 1951.
**Tree:** high vigour and excellent affinity with quince. Very productive, partially self-compatible, can fruit parthenocarpically.
**Fruit:** medium-large size, light-yellow skin slightly blushed by the sun; firm melting white flesh, resistant to excessive textural loss, of reasonably good flavour.
**Overall:** common in the region of Emilia-Romagna and also in southern Italy for good productivity, large and attractive fruit.
**Synonyms:** Santa Maria Morettini

PASSACRASSANA
**Origin:** France, uncertain parentage. Known since 1885.
**Tree:** medium-high vigour and excellent affinity with quince, very high and consistent productivity; requires strong pruning.
**Fruit:** very large size, apple- or tear-drop-shaped; thick yellowish green skin, firm grainy texture, sweet aromatic, can be stored cold until February.
**Overall:** still of interest for productivity, fruit size, flavour, suitable for processing, grown in northern Italy. Very sensitive to bacterial fireblight.
**Synonyms:** Edel Crassane, Passe Crassane Boisbunel.

TURANDOT*
**Origin:** Loreno Rivalta, Istituto Sperimentale per la Frutticoltura, Forlì station (Italy). Cross of Dr Guyot x Bella di Giugno, released in 2000.
**Proprietor:** CRA-FRF, Forlì, Italy
**Tree:** intermediate vigour and good affinity with quince, high and consistent productivity.
**Fruit:** medium size, elongated pear shape, yellow-green skin with 10% red blush; flesh medium fine-textured, juicy and lightly aromatic.
**Overall:** of interest for ripening date and productivity; withstands handling and stores well. Suitable for growing also in northern Italy.

WILLIAM
**Origin:** England, of uncertain parentage. Known since 1765.
**Tree:** medium vigour and poor affinity with quince; high productivity, fruit mainly on short shoots.
**Fruit:** medium-large fruit, quince- or pear-shaped; yellow skin may blush in sun; melting white, fine, very juicy
aromatic flesh, excellent flavour; very firm and resistant to excessive textual loss. **Overall:** excellent quality, good storage potential, also suitable for commercial processing for syrups and juices.

**Synonyms:** Bartlett, Beurre William, Bon-Chrétien, Davis William’s, Doyène Clément.

### POLLINATION

All pear varieties are self-incompatible, and despite the parthenocarpy that characterises the species, to ensure abundant crop load and quality it is necessary to plant two compatible varieties with overlapping bloom.

### TRAINING SYSTEMS AND TREE SPACING

Increasingly high quality standards encourage the use of systems, including the continuous wall, that allow the production of quality fruit in terms of size and organoleptic attributes. Modern knowledge of fruit tree physiology contributes to years of field experience to achieve this goal.

### PALMETTE

For medium density orchards and small farms. The continuous tall thin wall with more or less regularly spaced branches is obtained by planting good nursery stock with lateral branches left long, or by cutting back weaker un lignified stock without lateral branches.

### SPINDLE

A training system that suits the natural form and physiological needs of pear trees. Numerous variants exist, each with its own technique, and they are useful for medium-density orchards. Young nursery stock should have strong trunks and intact side branches so that the trees are well-balanced. If the young trees must be pruned back, the result will be expensive bending and curving of too-vigorous branches with diameters similar to the main trunk, and late differentiation of flower buds on unproductive wood.

If well done, the spindle allows the formation of a continuous productive wall of lower height than the palmette, easier orchard management from ground-level, bringing lower costs, earlier entrance into production, higher productivity and higher fruit quality due to better light exposure.

### TRELLISED-Y

This system also creates a wall of foliage, using intact nursery stock with pre-existing laterals, or using stock of good diameter, cut back to 60 cm, from which 2 new shoots will be selected for the permanent tree structure. The possibility of dividing vigour along two axes has some advantages, such as better control of vegetation with reduced pruning costs.

### VERTICAL CORDON

This is an application of pruning principles used for training apple, also known as the “super-spindle”. There is a central axis on which many small weak and renewable branches are placed.

The orchard is established using nursery stock with existing lateral branches that are not too vigorous and are not pruned back, planting the trees closely. It is essential to prune all side shoots with a diameter of more than 50% of the diameter of the trunk. The very early entrance into production and the root competition complemented by, when necessary, management techniques like root pruning and trunk girdling, favour controlled growth and development of a continuously fruiting wall.

### PRUNING OF MAIN VARIETIES

Pruning is a necessary evil, in the sense that with “the least damage possible” certain goals are achieved. This is one of the first definitions used to describe this important management technique. The objective of pruning is to maintain, in productive orchards, a vegetative-fructifying balance such that:

1. the training system is maintained,
2. production is constant across years,
3. fruit size remains large.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Most fruit borne on:</th>
<th>Type of pruning required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abate Fétel</td>
<td>spurs</td>
<td>severe, short</td>
</tr>
<tr>
<td>Carmen</td>
<td>spurs and short shoots</td>
<td>severe with thinning of fruiting branches</td>
</tr>
<tr>
<td>Conference</td>
<td>spurs</td>
<td>severe, short</td>
</tr>
<tr>
<td>Decana del Comizio</td>
<td>spurs</td>
<td>very light in first years, then removal of 40% fruiting wood</td>
</tr>
<tr>
<td>Kaiser</td>
<td>spurs and mixed shoots</td>
<td>long, thinning of small branches</td>
</tr>
<tr>
<td>William Max Red</td>
<td>spurs, short shoots and mixed shoots</td>
<td>long, severe thinning of fruiting branches</td>
</tr>
<tr>
<td>Bartlett</td>
<td>spurs</td>
<td>very short, shortening of fruiting wood</td>
</tr>
<tr>
<td>Passacrassana</td>
<td>spurs</td>
<td></td>
</tr>
</tbody>
</table>
FOR 50 YEARS WE'VE BELIEVED IN RESEARCH, INNOVATION AND QUALITY

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fllifesti@libero.it | www.fratellifesti.it
OUR BUSINESS SUPPLIES VERSATILE EQUIPMENT: DEVELOPED FOR SPEEDING UP FRUIT HARVEST WITH BINS OR INTO INDIVIDUAL BOXES, IT CAN ALSO BE USED FOR OTHER ORCHARD WORK (PRUNING OR THINNING). INDISPENSABLE PLATFORMS CAN BE RAISED AND EXPANDED FOR THE ASSEMBLY, OPENING AND CLOSING ANTI-HAIL NETS. ALL MODELS ARE AVAILABLE IN DIFFERENT VERSIONS TO SATISFY THE DIVERSE NEEDS OF FRUIT GROWERS.
When considering pruning in productive orchards, the distinction between two types of pruning should be made:

- **MAINTENANCE PRUNING** (pruning for production)
- **CORRECTIVE PRUNING** (special pruning)

**MAINTENANCE PRUNING**

This is of fundamental importance in achieving consistent high quality over the years by avoiding alternate bearing. Three kinds of pruning cuts are made:

1. Thinning cuts
2. Heading cuts
3. Renewal cuts

**Thinning cuts:** these eliminate mixed branches that are too vigorous or too abundant, thinning the canopy to improve light penetration to the interior. Old fruiting wood is also removed and spurs are thinned; this is of key importance for some varieties which may have scarce or poor quality fruit (Abate Fétel, Passacrassana, Decana del Comizio).

**Heading cuts:** these concern mixed branches and second-year wood and are of importance to ensure good fruit set, especially in some varieties (Abate Fétel, Decana del Comizio), and to encourage good fruit size. On spurs only one floral bud should be left.

**Renewal cuts:** of importance not only in limiting tree height and depth but also to ensure a constant vegetative renewal in order to achieve high quality fruit.

**CORRECTIVE PRUNING**

This is intended to correct or re-shape the tree, and has two main goals:

1. Prevent excessive shading
2. Reinvigorate the scaffold branches, preventing premature senescence and favouring the growth of new branches which will become fruiting wood.

The objective of corrective pruning is to favour the maximum light interception by leaves and fruit as well as to stimulate the tree to produce future fruiting branches in the lower part of the canopy. The vegetative rejuvenation of the tree brings decided improvements in fruit size. Often the problem is found in “wall” training systems where over the years pruning has been done incorrectly; the most common remedy is a renewal cut on the uppermost “leader” and on the primary scaffold branches which reduced canopy dimensions significantly.

**ABATE FÉTÈL**

This variety requires strong pruning, shortening young branches with much fruiting potential; generally needs a rejuvenation of the canopy by 40-50% by removing some spurs.
The best moment for pruning is at budbreak; this positive effect seems due to a slight ritardation of vegetative growth which favours the competitiveness of newly fertilized flowers.

In recent years, a style of pruning has been developed that nearly eliminates all first-year wood without apical floral buds, and renews 60-65% of the canopy. Orchards on MC quince must be pruned even more severely than other rootstocks, leaving fewer floral buds, since this rootstock is a reliable producer.

CARMEN
Early bearing indicates that this variety requires 35-40% renewal of spurs and prefers the maintenance of good-sized branches to obtain large fruit.

The natural “candelabra” growth habit of this variety requires severe pruning back to medium length; requires little renewal pruning. Give the canopy a “clean” look, giving much opportunity for light to penetrate the canopy interior and redden the fruit, a commercially-desirable feature of this variety.

CONFERENCE
This variety requires relatively a lot of second-year wood to be left on the tree, rich with fruiting spurs, which guarantees higher fruit quality. Generally, Conference requires renewal of 35% spurs, but removing 3 - 4 year-old wood. Two-year-old spurs produce large, regular, uniformly ripening fruit compared to the smaller more irregular fruit formed on older fruiting wood. Maintaining the correct proportions of young and old wood reduces the time spent on manual thinning to few hours/hectare.

DECANA DEL COMIZIO
Pruning consists mainly of shortening mixed branches with many floral buds. Decana requires 40% renewal of fruiting wood. It can fruit on 1-year-old wood but these fruits are not large. On fruiting branches it is best to leave no more than 8-10 spurs.

KAISER (BOSCH)
This variety requires long pruning and thinning of excess branches by removing old wood. 70% of fruit is borne on spurs on old wood. Mixed buds have more “sink” strength relative to shoots, meaning that they are more competitive for resources. Mixed buds usually are large and tol-
erate winter cold better than in other varieties. Though the literature recommends having more than 50% of productive wood being older than 3 years, since graft affinity with quince is poor (even with an interstock), it is advisable to cut some current year wood to stimulate vegetative growth as much as possible with benefits for fruit quality and size.

**WILLIAM AND MAX RED BARTLETT**
These varieties require long pruning with severe thinning of fruiting branches; generally with 35-40% renewal. Since they bear fruit on various branch types, these are possibly the easiest varieties to prune and with the most elastic timing for pruning. In old orchards, renewal pruning is used to stimulate the formation of fresh wood and maintain fruit size.

**PASSACRASSANA**
Pruning must be severe and short on all branches, removing the apical portion so that one or more vegetative buds don’t produce shoots that are competitive with the fruiting wood. This variety requires renewal of 30-35% of the fruiting wood to avoid canopy aging.

**FERTILISATION**
The nutritional needs of pear trees depend mainly on the soil conditions, productivity, rootstock and orchard management. Overall, pear requires less macronutrients (N,P,K) but more organic matter, calcium, and available iron than do other fruit trees (see tab. 6).

One-third of the annual nitrogen should be applied after flowering divided in 2-3 applications. Phosphorus is taken up at the start of the vegetative cycle. Availability of this element depends on soil pH (ideal range 5.5-6.5). Values above or below the optimal range bring a rapid insolubilisation of phosphorus, which then becomes unavailable to the tree. The potassium requirement during the growing season starts low, but increased rapidly with the set and growth of fruit. The requirement is roughly 80-90 kg/ha, more in humid conditions.

Calcium is the element most required by pear. It should be applied 4-6 weeks after flowering. It is likely the most important nutrient for fruit quality and improving storage life. The magnesium requirement is particularly high in moments of intense growth. Pear needs moderate amounts of magnesium in comparison to other fruit species. Uptake can be negatively influenced by excessively low pH and by excess potassium.

Iron is the element of greatest importance for pears, because its absence induces chlorosis: a yellowing between veins in the most apical leaves.
This happens most often in calcarceous soils and with quince rootstocks. Budbreak and bloom are the critical moments for uptake of iron chelates, which if not applied when needed, can compromise the following year’s production.

**IRRIGATION**

The quantity of water required by the pear orchard must be evaluated by considering weather, soil characteristics, rootstock and variety. In new intensive orchards on weak quince stock, irrigation must be frequent, even 3 times a week, especially in critical periods like fruit growth. Measurement devices can be placed near the roots at varying depths, to gain information regarding the soil moisture profile and thus the need to irrigate. Among irrigation systems, the most preferable are drip or microsprinkler, which can also be used for fertigation.

The correct management of irrigation allows the slowing of vegetative growth without compromising fruit growth; this “controlled deficit irrigation” technique is used in intensive orchards where the root systems are superficial, both be-
cause trees were planted higher in the soil and because weak quince stocks have shallow roots. This technique is particularly affective 40-50 days after bloom when competition between fruit and shoots is particularly strong.

### HARVEST

To choose the optimal moment to harvest pears, the grower must use objective indices such as flesh firmness (kg/cm²), soluble solids content, starch content and total acidity. Recently, non-destructive means of measurement have been developed, using the “NIR” system which determines the degree of ripeness using radiation of near infrared wavelength.

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### Nutrition programme to improve the production of Pear tree

<table>
<thead>
<tr>
<th>soil application</th>
<th>2 kg/ha</th>
<th>3 kg/ha</th>
<th>40 l/ha</th>
<th>30 l/ha by 1-2 times from the definitive fruit drop</th>
<th>5 Kg/ha</th>
<th>20 l/ha</th>
<th>5 l/ha by 3-6 times for the fruit enlargement</th>
</tr>
</thead>
<tbody>
<tr>
<td>KATA BIOL</td>
<td>Biostimulant, improves the vegetative growth. Prevents and cares against frost and spring stress</td>
<td>Prevents the alternation of production. Enhances the fruit development. Helps the plant to withstand high temperatures</td>
<td>Stimulates the vegetative development and improves the Iron absorption</td>
<td>Improves the fertilizers absorption. Increases the microflora in the soil</td>
<td>Facilitates the rooting. Stimulates the vegetative development</td>
<td></td>
<td>Improves the preservation and the shelf-life</td>
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<tr>
<td>IDROL-VEG</td>
<td>2-3 l/ha</td>
<td>1-2 l/ha</td>
<td>40 l/ha</td>
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<tr>
<td>IDROL-VEG</td>
<td>Keeps down vegetative surplus. Reduces fruit drop after setting. It’s a great systemic carrier. Increases the formation of natural defense substances (phytoalexins)</td>
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<tr>
<td>FUNGICROPS</td>
<td>2 l/ha</td>
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<td>LEACOMBI</td>
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<td>LEVO-ENERGY</td>
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<tr>
<td>IDROL-VEG</td>
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<td>EVOL</td>
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<td>EVOL</td>
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</tbody>
</table>

For further information please contact our Technical Department

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## Pest and disease management for Pear

<table>
<thead>
<tr>
<th>DISEASE / PEST</th>
<th>Commercial Product Name</th>
<th>Active Ingredient</th>
<th>Dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DORMANCY THROUGH SWOLLEN BUDS</strong></td>
<td></td>
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</tr>
<tr>
<td>PEAR SCAB (Venturia inaequalis) and APHIDS (Aphis pomi)</td>
<td><strong>Actara</strong> 25 WG</td>
<td>THIAMETHOXAM 25%</td>
<td>30-40 g/ha</td>
<td>Treat only after bloom. Mow any blooming weeds before applying product.</td>
</tr>
<tr>
<td><strong>GREEN TIPS THROUGH PRE-BLOOM</strong></td>
<td></td>
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<tr>
<td>PEAR SCAB (Venturia pirina)</td>
<td><strong>Chorus</strong></td>
<td>CYPRODINIL 50%</td>
<td>30-50 g/ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Switch</strong></td>
<td>CYPRODINIL 37,5%+FLUIDOXONIL 25%</td>
<td>60-80 g/ha</td>
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<tr>
<td></td>
<td><strong>BELLIS</strong></td>
<td>PYRASTROBIN 12,5%+BOSCALID 25%</td>
<td>55 g/ha</td>
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<tr>
<td></td>
<td><strong>FOLICUR WG</strong></td>
<td>TEBUCONAZOLO 25%</td>
<td>50-75 g/ha</td>
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<tr>
<td></td>
<td><strong>TMTD 50 SC</strong></td>
<td>TIRAM 44%</td>
<td>290-400 g/ha</td>
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<tr>
<td></td>
<td><strong>POMARSOL 80 WG</strong></td>
<td>ZIRAM 80%</td>
<td>180-250 g/ha</td>
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<tr>
<td><strong>BROWN SPOT</strong> (Stemphylium vesicatorium)</td>
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<tr>
<td></td>
<td><strong>DIQIAT</strong> 17%</td>
<td>3,3 - 5 l/ha</td>
<td>Recommended in young orchards and nurseries.</td>
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<tr>
<td></td>
<td><strong>GLYPHOSATE</strong> 27,9%</td>
<td>1,5-8 l/ha</td>
<td>Only in bearing orchards, for use with shielded equipment. Dosage depends on sensitivity of the weed species and on the type of equipment used.</td>
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<tr>
<td></td>
<td><strong>FLUAZIFOP-P-BUTILE</strong> 13,4%</td>
<td>0,75-2 l/ha</td>
<td>For grassy annuals and perennials.</td>
<td></td>
</tr>
<tr>
<td><strong>PETAL FALL THROUGH SMALL FRUIT</strong> (continua)</td>
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</tr>
<tr>
<td>PEAR SCAB (Venturia pirina)</td>
<td><strong>Score</strong> 10 WG</td>
<td>DIFENCONAZOLO 10%</td>
<td>37,5 g/ha</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>DITHANE DG NEOTEC</strong></td>
<td>MANCOZEB 75%</td>
<td>200 g/ha</td>
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</tr>
<tr>
<td></td>
<td><strong>DELAN 70 WG</strong></td>
<td>DITHIANON 70%</td>
<td>100-150 g/ha</td>
<td></td>
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<tr>
<td></td>
<td><strong>FOLICUR WG</strong></td>
<td>TEBUCONAZOLO 25%</td>
<td>50-75 g/ha</td>
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<td><strong>POMARSOL 80 WG</strong></td>
<td>ZIRAM 80%</td>
<td>180-250 g/ha</td>
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</tr>
</tbody>
</table>

continues on page 158
### DISEASE / PEST Commercial Product Name Active Ingredient Dose Notes

#### BROWN SPOT (Stemphylium vesicarium)
- **Switch**
  - Cyprodinil 37.5% + Fludioxonil 25%
  - 60-80 g/hl
- **Bells**
  - Pyraclostrobin 12.8% + Boscalid 25.2%
  - 55 g/hl
- **Folicur WG**
  - Tebuconazole 25%
  - 50-75 g/hl
- **TMDT 50 SC**
  - Tiram 44%
  - 290-400 g/hl
- **Pomarsol 80 WG**
  - Ziram 80%
  - 180-250 g/hl

#### FIRE BLIGHT PREVENTION (Erwinia amylovora)
- **Bion’so WG**
  - Acibenzolar - S - Metile 50%
  - 15 g/hl
- **Prodeo 80WG**
  - Fosetil Aluminum 80%
  - 250 g/hl

#### BACTERIAL NECROSIS OF BUDS AND FLOWERS (Pseudomonas syringae)
- **Prodeo 80WG**
  - Fosetil Aluminum 80%
  - 250 g/hl
  - 3 treatments at intervals of 15 days.

#### MITES (Panonychus ulmi e Tetranychus urticae Epitryperus pyri, Epitrix pyri)
- **Vertimec EC**
  - Abamectin 1.84% (Vertimec EC)
  - 75 ml/l
- **Vertimec Pro**
  - Abamectin 1.75% (Vertimec Pro)
  - 75 ml/l
  - Add BREAK-THRU® S 240 250 ml/ha or 0.25% mineral oil.

#### IMPROVES FRUIT SET
- **Berelex 40SG**
  - GA3 40%
  - 2.5-5 g/hl (stimulates fruit set)
  - 5-7.5 g/hl (reduces cold damage)
  - Two treatments: the first in early bloom, the second 2-3 days later.

### DISEASE / PEST Commercial Product Name Active Ingredient Dose Notes

#### CODDLING MOTH (Cydia pomonella)
- **Affirm**
  - Emamectin Benzoate 0.95%
  - 250-300 g/hl
  - Add 250 ml/ha of BREAK-THRU® S 240.

#### ORIENTAL FRUIT MOTH (Cydia molesta)
- **Suprafos EC**
  - Clorpirifos Etile 75%
  - 55-70 g/hl
  - Add 250 ml/ha of BREAK-THRU® S 240.

#### SMALL FRUIT THROUGH HARVEST
- **Blont®50 WG**
  - Acibenzolar - S - Metile 50%
  - 15 g/hl
- **Prodeo 80WG**
  - Fosetil Aluminum 80%
  - 250 g/hl

#### BROWN SPOT (Stemphylium vesicarium)
- **Geoze**
  - Fludioxonil 50%
  - 30 g/hl (0.45 kg/ha)
  - Also for storage rot.
- **Bells**
  - Pyraclostrobin 12.8% + Boscalid 25.2%
  - 55 g/hl
- **Folicur WG**
  - Tebuconazole 25%
  - 50-75 g/hl
- **TMDT 50 SC**
  - Tiram 44%
  - 290-400 g/hl
- **Pomarsol 80 WG**
  - Ziram 80%
  - 180-250 g/hl

### WEEDS (BROAD-LEAVED AND GRASSY ANNUALS AND PERENNIALS)
- **Reglone W**
  - Diquat 17%
  - 3.3-5 l/ha
- **Touchdown**
  - Glyphosate 27.9%
  - 1.5-8 l/ha
- **Fusilade Max**
  - Fluazifop-P-Butile 13.4%
  - 0.75-2 l/ha

### HARVEST THROUGH DROP
- **Coprantol’WG**
  - Copper Oxychloride 32%
  - 500 g/l
- **Coprantol’HiBio**
  - Copper Hydroxide 25%
  - 160-170 g/l

**PRODUCTS OF THE SYNGENTA GROUP ARE IDENTIFIED WITH THEIR RESPECTIVE LOGOS. THE FOLLOWING TABLES INCLUDE CROP PROTECTION PRODUCTS AUTHORIZED IN ITALY AT THE DATE THIS DOCUMENT WAS CREATED.**
UNI_TWIN jolly®
multi-product electronic sorter designed to process both small size and elongated shape ones

Safe, reliable and versatile technology for pear processing

“WE BUILD” INNOVATION!
to give RESULTS!