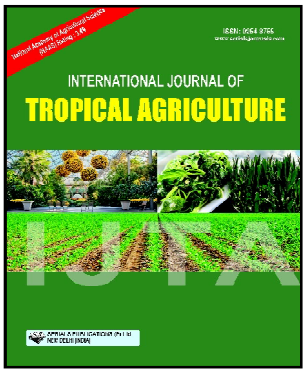

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Quince (*Cydonia oblonga*) - a potential dwarfing rootstock for high density planting of pear in Himachal Pradesh

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Abstract: The shifting trend of land use pattern from agriculture to fruit crops in the past few decades has increased. The fluctuation in the production of fruit crops during last few years indicates necessity to explore & harness the vast horticultural potential of the state through diversified horticulture production and ancillary horticultural activities. Rejuvenation and harness of *Cydonia oblonga* a valuable rootstock of Pear can help to mitigate the challenges faced by this fruit crop and form the basis for high density orchard. *Cydonia oblonga* commonly known as 'Quince' (or Bahee Dana, Strythion & Safarjal) is a deciduous small tree or shrub having 5-8 ft height with single member of genus Cydonia belongs to family Rosaceae. It can be propagated easily as hardwood cutting in the month of June and is highly productive on stools. The seeds can be sown in February and requires stratification. It has been used for long time as a dwarfing rootstock for Pear (with some variety only) with earlier bearing & bit early maturing of good quality fruit. It is in bloom in the month of May and seeds ripen in November. It prefers moist soil & sunny area. Its fruit has bright yellow coloration with average weight 169.77gm and 68.92mm by 71.98mm in size. These seeds remain enclosed within fruit cavity of size 29.47mm by 32.07mm. The fruit has astringent taste, characteristic aroma and average no. of 70 seeds arranged in two vertical rows with 4.67gm of single seed weight. Besides dwarfing rootstock Cydonia, the species which are evaluating for Pear rootstock at present research site (ICAR-IARI, Research Farm, Dhanda, Shimla-11, H. P) are *Pyrus calleryana, P. communis, P. serotina, P. pashia,* & *P. pashia var. kumaoni.* These all rootstocks are vigorous in nature. Some pear varieties are not compatible when grafted on Quince. In such cases, a 6-inches interstock (Beurre Hardy) between the Quince & the scion variety show compatibility.

Key words: *Cydonia oblonga,* root stock high density planting, pear

INTRODUCTION

The H.P state economy growth is determined by the trends in agricultural & horticultural production. The contribution of agricultural and allied sectors in state domestic product is declining due to shifting of this sector in to industries & service sectors. Most European Pear (*Pyrus communis*) scion cultivars are propagated on either rootstocks of the same species or on quince (*Cydonia oblonga*) rootstocks. Occasionally, other Pyrus species, such as are *Pyrus calleryana, P. communis, P. serotina, P. pashia,* & *P. pashia var. kumaonii etc* are also used as rootstocks, but trees raised on these are invariably extremely vigorous and unsuited to modern systems of high density tree management. The many advantages are associated with using quince rootstock clones and several new clonal quince stocks selections are available in world especially in Europe. The problems associated with use of quince rootstocks are poor graft compatibility with many pear scion cultivars, sensitivity to winter cold injury and to highly calcareous soils (Webster, 1998). Most *Pyrus communis* rootstocks are very vigorous, difficult to propagate vegetatively and are poor in inducing precocious cropping in the scion. There is need to breed and select new improved clonal *Pyrus* rootstock for hill state.

PRESENT STATUS

Plants are not only a dietary source for both human beings and animals but also safer phytomedicines. Traditionally, phytomedicines have been used to treat various ailments in Unani-tibb, Chinese, and ayurvedic systems of therapies. *Cydonia oblonga* (Syn: Quince, Bahee Dana, Strythion, and Safarjal), a plant of family *Rosaceae* (Khoubnasabjafari and Jouyban, 2011) is popular for its medicinal, nutritional, and ornamental uses. Its fruit is used in food industry as a source of pectin that protects colonal damage in irritable bowel syndrome (IBD) and peptic ulcer (Hamauzu *et al.*, 2008; Minaiyan *et al.*, 2012). The presence of vitamin C and different minerals such as phosphorus, calcium, potassium, sodium, and nitrogen in quince fruit has also been reported (Rop *et al.*, 2011). Seeds of the plant are traditionally utilized for the treatment of diarrhea, cough, dysentery, sore throat, constipation, and bronchitis (Duke *et al.*, 2002; Prajapati *et al.*, 2006). The presence of different phenolics, organic acids, and amino acids has also been described in Quince seeds (Silva *et al.*, 2005). On the basis of fruit shape, two varieties of Quince are available: *C. oblonga* sub sp. Maliformis & Polyformis with apple & Pear shaped fruit respectively.

Quince (*Cydonia oblonga*) is still conserved with ICAR-IARI, horticultural research farm, Dhanda, Shimla-11 and presently available small trees are in fruiting stage at this geographical point. It is native to Iran & Turkey & is cultivated in India, South Africa, Middle East & Europe. The natural shape of quince is a shrub or bushy-like, without thorns, with deciduous leaves, alternate on the shoot (Picture 1). Shoots are brown with pale or dark-green tonalities covered by hair more o less abundant, but easily removable. Internodes are of medium length (6-7 cm) with lenticels. Root system is quite shallow and does not permit a good anchorage for plants. Quince leaves show a remarkable variability depending on their position and the vigour of the shoot. The upper face generally is glabrous, while the inferior one is hairy.

Picture 1. Quince (*Cydonia oblonga* M.) small tree or Shrub

Flowers are white or rosy, single and located at the tip of tiny shoots. When the flower is completely open the diameter in the different varieties ranges 3 to 7 cm. Each flower has 5 sepals, 5 petals, 20 stamens and 5 pistils. It is propagated by seeds and stools. The concept of high density system with high quality yield is need of the hour. Traditional rootstocks are used more for pear in our hill state which is vigorous in nature. Pear rootstocks viz. QA, QC, BA 29 and PY have been introduced by nurserymen in H.P for popularising dwarfing rootstocks. While, in Europe Quince is used as the main pear rootstock; however their diffusion has led to several problems including incompatibility with some scion varieties, development of iron chlorosis and low hardiness to winter cold. Rootstocks belonging to *Pyrus communis* may overcome such problems. A breeding program obtaining *P. communis* rootstocks suitable for modern pear production has been in progress since 1980 at the Geisenheim Research Institute, Department of Pomology, Germany (Jacob, 2002). Out of more than 800 seedlings obtained from crossings of 'Old Home' x 'Bonne Louise d´Avranches', about 10 clones with low to medium vigour have been selected as interesting. One dwarfing clone released under the name Pyrodwarf induces low vigour, high precocity and yield efficiency, uniform fruit size, good graft compatibility with all varieties, good anchorage and winter cold hardiness, no sucker development and no lime-induced chlorosis on high pH soils. The variety name will be Pyrodwarf, the patent name 'Rhenus 1', respectively. A second clone with the name 'BU 2/33', (the patent name is 'Rhenus 3'), induces semidwarf to vigorous growth in scions, also shows very good yield properties and is recommended for combinations with very dwarfing scion varieties.

Quince fruit is a pome type with numerous seeds. Fruits are big with a characteristic fragrance; they show variable dimensions and also asymmetric shapes. The skin is covered by an abundant hair that disappears with fruit ripening. In this phase it gets a goldish-yellow colour. The white-yellow pulp is easily oxidised to air exposition, is firm and often rich in schlerinchymatous cells and generally is acid and astringent, so it does not suit for fresh consumption. Ripening normally occurs from October-November.

Picture 2: The fruit of Quince (*Cydonia oblonga* M.)

The fruit of quince is borne terminally on the current season's shoots arising from laterals and on the terminal buds on one-year old wood (Picture 2). This will naturally require adequate pruning every year. It should be such as to encourage 10 to 24 inches of new growth every year on the young bearing trees and 9 to 18 inches on older trees. The pruning should consist mostly of thinning and heading back to laterals. In actual practice, Quince trees bear fairly heavily even with less pruning. Its fruit has bright yellow coloration with average weight 169.77gm and 68.92mm by 71.98mm in size. These seeds remain enclosed within ovarian loculus of size 29.47mm by 32.07mm. The fruit has astringent taste, characteristic aroma and average no. of 70 seeds arranged in two vertical rows with 4.67gm of single seed weight (Table 1).

Table 1
The fruit data of Quince at ripen stage

S.No.	*Fruit weight (gm)*	*Fruit Length (mm)*	*Fruit width (mm)*	*No. of seeds in fruit*	*Single seed weight (gm)*	*Ovarian loculus (mm) L x W*
1	205.97	72.95	75.90	80	4.76	29.79 x 32.23
2	182.10	70.28	73.98	63	4.50	29.85 x 32.13
3	121.25	63.53	66.07	80	5.01	28.47 x 31.89
4	190.23	67.56	71.93	73	4.62	30.05 x 32.93
5	149.31	70.28	72.03	67	4.89	29.22 x 31.20

Future perspectives

In the past Quince was an important fruit trees species. The fruits are at the present given to the industry of transformation, and thus only a small portion is consumed as fresh fruit. Finally, the need for pear rootstock in the future is questioned. Will advances in genetic engineering techniques, if used to improve scion cultivars directly, render pear rootstocks obsolete in the future decades? *Cydonia oblonga* is rich in useful secondary metabolites such as phenolics, steroids, flavonoids, terpenoids, tannins, sugars, organic acids, and glycosides (Aneta Wojdy³o *et al*. 2013). A wide range of pharmacological activities like antioxidant, antibacterial, antifungal, anti-inflammatory, hepatoprotective, cardiovascular, antidepressant, antidiarrheal, hypolipidemic, diuretic, and hypoglycemic have been described to various parts of *C. oblonga*. The polysaccharide mucilage, glucuronoxylan extruded from seeds of *C. oblonga* is used in dermal patches to heal wounds.

The vigour and precocity of trees highly influences their efficiency in commercial production. In apple, dwarfing rootstocks allow high-density plantings while their precocious flowering enables earlier fruit production. Currently, there is a lack of pear (*Pyrus communis* L.) rootstocks that are equivalent to the high yielding apple rootstock 'M9'. For the efficient breeding of new *Pyrus* rootstocks it is crucial to understand the genetic determinants of vigour control and precocity. The application of breeding process of this rootstock (Quince) can confers both vigour control and precocity to the grafted scion of desired variety of the pear.

CONCLUSION

The shifting trend of land use pattern from agriculture to fruit crops in the past few decades has increased. The fluctuation in the production of fruit crops during last few years indicates necessity to explore & harness the vast horticultural potential of the state through diversified horticulture production and ancillary horticultural activities. Rejuvenation and harness of *Cydonia oblonga* a valuable rootstock of Pear can help to mitigate the challenges faced by this fruit crop and form the basis for high density orchard. It can be propagated easily as hardwood cutting in the month of June and is highly productive on stools. The seeds can be sown in February and requires stratification. It has been used for long time as a dwarfing rootstock for Pear (with some variety only) with earlier bearing & bit early maturing of good quality fruit. Some pear varieties are not compatible when grafted on Quince. In such cases, a 6-inches interstock (Beurre Hardy) between the Quince & the scion variety show compatibility. Quince trees bear fairly heavily even with less pruning. Its fruit has bright yellow coloration with average weight 169.77gm and 68.92mm by 71.98mm in size. These seeds remain enclosed within ovarian loculus of size 29.47mm by 32.07mm. The fruit has astringent taste, characteristic aroma and average no.

of 70 seeds arranged in two vertical rows with 4.67gm of single seed weight There is need to breed and select new improved clonal *Pyrus* rootstock for hill state to form the high density system. Exploration of conserved valuable dwarfing rootstock Quince by using latest techniques can enhance the diversified horticultural production toward pear fruit crop.

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