Short communication

Evaluation of selected *gonda* (*Cordia myxa* L.) genotypes on different rootstocks

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ABSTRACT

A study was conducted to evaluate high yielding *gonda* selections on three rootstocks, *viz*. large fruited *gonda*, small fruited *gonda* and *goondi*. The genotype CAZRI-G-2025 showed vigorous growth compared to others on all the three rootstocks. *Goondi* rootstock showed dwarfing effect with more lateral spread resulting in increased canopy area. The higher scion/stock ratio on *goondi* rootstock resulted in inverted bottleneck symptom at bud union compared to scion:stock ratio close to one on other two rootstocks. The mean fruit yield of *gonda* was higher on small fruited *gonda* compared to its own seedling rootstock irrespective of genotypes. The mean fruit yield over the years was highest in genotype G-2025 followed by G-2012 and G-2011 irrespective of rootstocks. Significantly higher fruit yield was recorded in genotype G-2025 as compared to other two genotypes. Contrary to other characters fruit yield showed decline in all the three genotypes when budded on *goondi* during 2010 to 2012, while it exhibited progressive increase on the other two rootstocks.

Key words: *Cordia myxa*, compatibilty, growth performance, stock: scion ratio, yield.

Gonda is potential underutilized fruit vegetable plant in arid and semi-arid regions of India. It belongs to family Boraginaceae. Being a multipurpose plant it has long been associated with health, nutrition and other diversified uses in curing certain human ailments. Green unripe fruits of *gonda* are much important as fresh vegetable and for preparation of pickles at a time when the availability of conventional vegetables are scarce (April-May). Its fruits are important constituent of famous "*Panchkuta*", a traditional mixed vegetable of Rajasthan.

Once established, it can give good returns even under rainfed conditions with little supplementary irrigation. *Cordia gharaf* (syn. *Cordia rothii*), *Cordia macleodii* and *Cordia sebestina* are other important species within the genus *Cordia. Corida gharaf* with its narrow leaves and strong tap root system can survive under rainfed conditions in arid zone and is more drought hardy than *Cordia myxa*. Generally, two types of *gonda* are found, *i.e.* small fruited (3-4 g) and large fruited (6-10 g) but large fruited ones have commercial significance. Traditionally, they are propagated by seeds which produce variable plant population. Another disadvantage with seed propagation is very low germination (20-30%) (Levy and Shakel, 4; Pundir *et al*., 9). The small fruited type has more germination (50-60%) are compatible for budding with commercial large fruited *gonda*, and hence they can be used as rootstock. Seed propagation, though, results in variation, but it is important for getting the rootstock seedlings since budding is fairly successful (Meghwal, 4, 5). In *goondi* also seed germination is more than 50% and budding of commercial *gonda* is successful (Meghwal and Azam, 5). Hence it was also tried for its long term compatibility with *gonda*. Among vegetative propagation methods, T-budding in the month of August has been found most successful (Levy and Shakel, 4; Satisha *et al*., 8, Pundir *et al*., 9). In view of the low seed germination and other problems associated with seed propagtion, this study was conducted to evaluate three high yielding *gonda* genotypes identified at CAZRI on three rootstocks.

A long term field study was conducted to evaluate the performance of three *gonda* selections budded on three rootstocks during 2004-12 at Central Research Farm, CAZRI, Jodhpur (26°18'N:73°04'E, 216 m amsl). Three elite genotypes, *i.e.* CAZRI-G-2011, CAZRI-G-2012 and CAZRI-G-2025 selected from seedling population were budded on three rootstocks, *viz.* large fruited *gonda*, small fruited *gonda* and *goondi* (C*ordia gharaf*). Uniform healthy plants were planted in the field at 6 m × 6 m spacing during August, 2004 under nine treatment combinations of scion and rootstocks with two plants per treatment and replicated thrice in randomized block design. The plants were trained timely by pruning the lateral branches to promote upright growth. Since *gonda* requires physiological rest period, manual defoliation was done every year during first week of January for uniform and early fruiting. The data were recorded

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every year on plant height, canopy area, scion and stock diameter above and below bud union, fruit yield, mean fruit weight and stone: pulp ratio. However, the data of 2010 were used for statistical analysis for vegetative growth and fruit characters while fruit yield being the most importanat parameter was taken for three consecutive years and analyzed statistically. Ten fruits were harvested randomly from each plant at fully developed stage (35 days after fruit set) but before ripening for recording data on fruit parameters. The scion and stock girth was measured by digital Vernier calipers from above and below the point of bud union to determine scion: stock ratio. The other cultural operations were applied uniformly to all the experimental plants.

Growth, stem diameter at bud union, fruit characters and fruit yield of different genotypes as influenced by rootstock are presented in Table 1. The results indicated significant differences in growth parameters due to rootstock and scion genotypes. The plant height was found significantly reduced on *goondi* rootstock in case of genotypes CAZRI-G-2012 and CAZRI-G-2025 as compared to those on *gonda* rootstocks, though it was reduced on small fruited *gonda* also but the differences were non significant. The genotype CAZRI-G-2025 showed the highest plant height followed by CAZRI-G-2012 and CAZRI-G-2011 on all the three rootstocks. *Goondi* rootstock showed dwarfing effect on genotypes CAZRI-G2012 and CAZRI-G2025, whereas, *gonda* and small fruited *gonda* exhibited non-significant influence on plant height of both the genotypes. The data on canopy area revealed reverse trend to plant height. All the genotypes in general budded on *goondi* rootstock exhibited more lateral growth resulting in increased canopy area. The genotype CAZRI-G-2025 showed significantly higher canopy area irrespective of rootstocks as compared to other two genotypes. The scion: stock ratio at bud union was one or slightly more than one in all the genotypes budded on large fruited *gonda* or small fruited *gonda* and the differences among them was non-significant, while it was significantly higher (1.32-1.42) in the genotypes budded on *goondi* rootstock as compared to the values obtained on the other two rootstocks. This was due to expression of inverted bottle shape syndrome on *goondi* rootstock as a result of differential growth rate between scion and rootstock. The scion and stock growth rates were influenced by inverted bottle neck symptoms were also reported in grapes grafted on different rootstocks by Satisha *et al*. (8) however, they did not notice appreciable effect on productivity of vines during initial years. Inverted bottleneck symptoms due to rootstocks were also reported in arid fruits like *ber* by Verma *et al*. (9) in variety *Gola* and by Prasad and Bankar (7) in variety Seb budded on *Jhar ber* (*Ziziphus nummalaria* L.).

The data on fruit parameters and yield were influenced significantly due to genotypes and rootstocks (Table 2). The fruit weight did not differ significantly among the genotypes budded on same rootstock but it reduced significantly on *goondi* rootstock, while it remained unaffected on both large and small fruited *gonda*. The pulp: stone ratio followed the same trend as observed in case of fruit

Table 1. Vegetative growth of *gonda* genotypes as influenced by rootstocks.

Treatment: Rootstock	Treatment: Scion	Plant height (m)	Canopy area (m^2)	Scion girth (cm)	Stock girth (cm)	Scion/stock ratio
Large fruited *gonda*	G2011	2.93	16.97	15.2	14.0	1.08
	G2012	3.40	16.64	16.8	16.2	1.03
	G2025	3.80	20.43	14.8	14.6	1.01
	Mean	3.37	18.01	15.6	14.93	1.02
Goondi	G2011	2.70	23.79	16.7	12.2	1.37
	G2012	2.93	24.13	14.8	11.2	1.32
	G2025	3.10	25.97	15.7	11.5	1.36
	Mean	2.91	24.63	15.7	11.6	1.37
Small fruited *gonda*	G2011	2.76	22.62	14.2	12.8	1.10
	G2012	2.93	19.79	13.8	13.5	1.02
	G2025	3.13	23.46	13.1	12.8	1.02
	Mean	2.94	21.95	13.7	13.0	1.05
CD (P = 0.05)		0.45	3.35	1.2	1.1	0.18

Table 2. Performance of selected *gonda* genotypes on different rootstocks for fruit weight, pulp: stone ratio and fruit yield.

Treatment		Mean fruit wt. (g)	Pulp/stone ratio	Fruit yield (kg plant^{-1})			
Rootstock	Scion			2010	2011	2012	Mean
Large fruited *gonda*	G2011	8.33	5.70	28.20	30.63	41.10	33.31
	G2012	8.40	6.10	31.74	34.33	43.83	36.33
	G2025	8.30	5.73	33.40	41.90	53.33	42.87
	Mean	8.34	5.84	31.11	35.62	46.08	37.50
Goondi	G2011	6.90	3.80	24.23	22.76	22.76	23.25
	G2012	7.60	4.93	27.03	26.50	25.76	26.43
	G2025	7.03	3.90	30.16	29.80	33.06	31.00
	Mean	7.17	4.21	27.14	26.35	27.19	26.89
Small fruited *gonda*	G2011	8.23	5.80	28.33	28.66	48.13	35.04
	G2012	8.26	5.93	34.66	35.40	53.10	41.05
	G2025	7.86	5.80	39.50	47.56	62.90	49.98
	Mean	8.11	5.84	34.16	37.20	54.71	42.03
CD (P = 0.05)		1.01	0.48	3.20	3.58	4.83	3.87

weight which is quite obvious. The genotypes did not show significant variation in pulp:stone ratio on large and small fruited *gonda* rootstocks, while significant variation was noticed on *goondi* rootstock. This meant that variation in pulp: stone ratio was purely due to the influence of *goondi* rootstock since the difference in pulp: stone ratio among the genotypes on the other two rootstocks was non significatnt. The fruit yield being the most important and ultimate goal of any breeding programme, was recorded continuosuly for three consecutive years to ascertain the results. It was also observed that the fruit yield was showing significant variation right from the beginning. The variation in most other parameters appeared to be due the influence of environment. Significant interactive influence of genotype-rootstock with respect to fruit yield was noticed from 2010 to 2012. It was interesting to note that mean fruit yield of *gonda* was higher on small fruited *gonda* as compared to the yield on its own seedling rootstock irrespective of genotypes. The reduction in yield on *goondi* rootstock may be due to delayed incompatibilty symptoms induced by gummosis. The yield variation due to rootstocks has been well documented in various *Citrus* species (Levy and Shakel, 2; Prasad and Bankar, 7) and *ber* (Pundir, 8). The mean fruit yield over the years was highest in genotype G-2025 followed by G-2012 and G-2011 irrespective of rootstocks. The significant variation in fruit yield among different genotypes may be due to the diffrence in their genetic potential and over all growth of genotypes. Such variataion in fruit yield due to variety or genotypes has earlier been reported in several fruit crops(Aulakh *et al.*, 1; Meghwal and Azam, 3). The different genotypes budded on similar rootstock also revealed significantly higher fruit yield in case of genotype G-2025 as compared to the other two genotypes. However, fruit yield of the genotypes G-2011 and G-2012 budded on large fruited *gonda* and *goondi* rootstocks was at par. On the other hand all the genotypes showed signifcant variation in fruit yield on small fruited *gonda* with highest mean yield in case of G-2025 (49.98 kg plant^{-1}). Another important observation with respect to the influence of rootstock on scion was that fruit yield showed decline in all the three genotypes budded on *goondi* rootstock from 2010 to 2012, whlie it exhibited progressive increase on the other two rootstocks. The problem of gummosis and resultant drying of branches was observed during March-April with higher severity on the plants raised on *goondi* rootstock. The oozing of gum in branches blocks the phloem and impedes the movement of water and nutrient which cause depletion in vegetative growth and ultimately leads to drying of branches. The size of leaves also remain small on *goondi* rootstocks during March to June, which coupled with drying of branches might have caused reduction in fruit yield of on *goondi* rootstock. In the light of above results and discussion it can be concluded that small fruited *gonda* can be recommended as rootstock for commercial big fruited *gonda* due to its better compatibility. The genotypes CAZRI-G2025 and CAZRI-G2012 were identified superior high yielding selections for arid areas.

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