Short Communication

Standardisation of grafting techniques in African marigold (*Tagetes erecta* L.)

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Abstract

A study was conducted during 2017-18 at the Department of Floriculture and Landscaping, College of Horticulture, Vellanikkara, Thrissur to standardise the grafting method, age of rootstock and age of scion in African marigold (*Tagetes erecta* L.). The experiment was laid out in Completely Randomised Design with 2 replications and 27 treatments, which comprised of different grafting methods (cleft, splice and hole insertion) using various stages of rootstock (4, 5, 6 and 7 weeks after sowing) and scion (3, 4 and 5 weeks after sowing). Among different treatments followed, cleft grafting 4 week old scion onto 6 week old rootstock was found to be superior in terms of graft survival. There was no survival when grafting was done on four week old rootstock, irrespective of the grafting methods. It was also observed that hole insertion method was not successful, irrespective of the age of root stock and scion.

Keywords: African marigold, Cleft grafting, Hole insertion grafting, Splice grafting.

African marigold (*Tagetes erecta* L.), one among the most important flower crops belonging to the family Asteraceae, is mainly grown as a loose flower crop and used for making garlands, decorations and religious offerings. Due to its varied uses, marigold cultivation is found to be quite remunerative. There is high demand for marigold flowers in Kerala, especially during festival seasons. Neighbouring states act as the major source of the flowers. The agro climatic conditions of Kerala is suitable for successful cultivation of African marigold, throughout the year. However, cultivation of marigold has only been taken up in the near past in Kerala. Nowadays, farmers are using F_1 hybrids of marigold that produce attractive and large flowers. Recently many farmers raising F_1 hybrids were complaining about the sudden wilting of plants, resulting in huge crop loss. This sudden wilting of plant was attributed to infestation by the bacteria *Ralstonia solanacearum*. Nimisha (2016) also reported the incidence of bacterial wilt in African marigold under Kerala conditions. Grafting on wilt resistant root stocks has facilitated successful cultivation of F_1 hybrids and varieties in various solanaceous and cucurbitaceous vegetables. Hundred per cent control of bacterial wilt through grafting in solanaceous crops *viz*., tomato and chilli, was reported by Narayanankutty et al. (2015).

Umesh (2017) had identified one wilt resistant genotype (M-1) in African marigold and reported that grafting of susceptible genotypes on this resistant rootstock was found to be an effective tool for controlling bacterial wilt. However, the study pointed out the need for standardisation of grafting techniques in the crop for maximum graft survival. Keeping this in view, the present study was

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conducted with the objective to standardize the grafting methods, and age of root stock and scion in African marigold.

The local type of marigold M-1, which was already found resistant to bacterial wilt was used as the root stock. F_1 hybrid Maria-91 which was already found susceptible to bacterial wilt was used as the scion. Seeds of root stock (M-1) and scion (Maria 91) were sown in protrays filled with soilless media comprised of coco peat, vermiculite and perlite in the ratio 3:1:1. Seeds of rootstock and scion were sown at required time intervals to ensure seedling availability for different stages of root stock and scion combinations. Grafting was done once the seedlings reached the specified age. The experiment was laid out in Completely Randomised Design with 2 replications and 27 treatments, which comprised of different grafting methods (cleft, splice and hole insertion), various stages of rootstock (4, 5, 6 and 7 weeks after sowing) and scion (3, 4 and 5 weeks after sowing). Number of grafts per treatment per replication was 100.

Significant difference was observed with respect to per cent survival of grafts (Table 1). Cleft grafting four week old scion onto six week old rootstock showed maximum survival percent (61%) which was on par with cleft grafting five week old scion onto six week old rootstock (56%) and cleft grafting three week old scion onto seven week old rootstock (45%). Lowest survival of grafts (13%) in cleft grafting method was observed when five week old scion was grafted on to five week old rootstock. There was no survival when grafting was done on four week old rootstock, irrespective of the grafting methods. In splice grafting method also, maximum survival of grafts (37%) was observed when four week old scion was grafted onto six week old root stock. From the data given in Table 1, it was also observed that irrespective of the age of root stock and scion, hole insertion method was not successful. Cleft grafting has been reported as best method in tomato by Vuruskan and Yanmaz, (1991) and Silva et al. (2016). In brinjal also, cleft grafting has been reported as the best method by Honma (1977) and Trentini and Maioli (1989). Lee (1994) reported that grafting methods vary considerably with the type of crop being grafted, and sowing time of rootstock and scion.

Age of rootstock was found to have pronounced effect on successful graft union. Among the rootstocks of different ages used in this study, six week old rootstock was found to be more suitable and successful in terms of survival of graft in both cleft and splice grafting method. Traka-Mavrona et al. (2000) also reported that even by adopting the same grafting method, survival ratio might be different in relation to both rootstock and scion. Among the treatments to determine the suitable age of scion, it was observed that four weeks old scion was the best for survival in both cleft and splice method of grafting. This result is in agreement with the findings of Oda et al., (2000). As different grafting methods are suitable for different crops, the optimum age of rootstock and scion would also vary with the crop. This is justified by the findings of Tamilselvi and Pugalendhi (2016) in bittergourd, where they obtained the best results with rootstock and scion having the same diameter.

No significant difference was observed for the number of days taken for graft union (Table 1). Irrespective of the methods of grafting, the age of rootstock and scion, visual union of rootstock and scion was observed on the fourth day after grafting in all successful treatments. In all other treatments where grafting was not successful, no visual graft union was observed. Fernandaz-Garcia et al. (2004) observed that in tomato, xylem differentiation began as small areas of lignification on the 4^{th} day after grafting.

From the study conducted, it could be concluded that cleft grafting of four week old scion on six week old rootstock is the best grafting method in African marigold for maximum graft survival.

Table 1. Percent survival of African marigold grafts

Grafting methods	Age of root stock (weeks)	Age of scion (weeks)	Per cent survival (%)	Days taken for graft union
Cleft	4	3	0 (1)*	4
"	4	4	0 (1)	"
"	5	3	31 (5.59)	"
"	5	4	19 (4.43)	"
"	5	5	13 (3.73)	"
"	6	3	33 (5.67)	"
"	6	4	61 (7.86)	"
"	6	5	56 (7.54)	"
"	7	3	45 (6.78)	"
Splice	4	3	0 (1)	"
"	4	4	0 (1)	"
"	5	3	29 (5.43)	"
"	5	4	14 (3.76)	"
"	5	5	13 (3.73)	"
"	6	3	24 (4.84)	"
"	6	4	37 (6..09)	"
"	6	5	25 (4.92)	"
"	7	3	34 (5.90)	"
Hole insertion	4	3	0 (1)	"
"	4	4	0 (1)	"
"	5	3	0 (1)	"
"	5	4	0 (1)	"
"	5	5	0 (1)	"
"	6	3	0 (1)	"
"	6	4	0 (1)	"
"	6	5	0 (1)	"
"	7	3	0 (1)	"
"	4	3	0 (1)	"
"	4	4	0 (1)	"
CD (5%)			16.67 (1.57)	
SE(m±)			5.71 (0.539)	

* Values in parentheses are transformed

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