

Review of anastomosis groups, the pathogenic factor of *Rhizoctonia* root rot of strawberry

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Abstract—The black root rot is one of the main diseases of strawberry. In the present research, the pathogenesis and anastomosis groups of both species *R. fragariae* and *R. solani* was reviewed in the provinces of Golestan, Mazandaran, Kordestan and Alborz.

The pathogenesis results on plant show the pathogenesis of total reviewed isolates. The isolates belonged to *R. fragariae* examined with isolates of both A and G groups and *R. solani* tested with group 6. The results indicate that the highest level of isolates in any of both species, belong to the anastomosis groups but groups different from groups A, G and 6.

Keywords— anastomosis group, disease intensity, *R. fragariae*, *R. solani*.

I. INTRODUCTION

The black root rot is one of the main diseases of strawberry which is caused by interaction of pathogenesis factors [10]. From the signs of given disease could refer to decay of root Cortex, stunt, necrosis, reduction and death of plant [5]. Comparing mean function of Strawberry fields and greenhouses in Iran with major producers of Strawberry in the world like America and Spain shows there is mean ideal function lower than 50 Percents which could attribute it to crown and root rot. The morphological, physiological and pathogenesis characteristics of *Rhizoctonia* spp. are of scales to determine intraspecific diversity and differences. But, authors always are sought most valid methods to categorize this fungous species. The use of anastomosis categorization has led to well ranking and determination of isolates of *R. fragariae* and *R. solani*. In the recent years, because of limitations which were desired in terms of using pesticides such as methyl bromide, the use of other control methods as prevention and use of resistant varieties is one of the main challenges for authors and farmers of strawberry. The major component of developing such resistant plants is to determine pathogenesis factor.

II. LITERATURE

The black root rot disease eradicates 2-4 percent of strawberry bushes in Florida state of America, annually and in suitable climate conditions, destroys 80 Percent of a field [3].

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In most references which related to before 1960, *Rhizoctonia solani* Kuhn has been indicated as the main isolated factor of infectious strawberry's root [4,12,13,18].

The new species, *R. fragariae* Husain and Mcken was introduced as one of pathogens and decay factors of Strawberry in Ontario state of Canada in 1963 [6]. In most of studies which were conducted to determine probable role of different fungous factors that involved in black root of strawberry, the *R. fragariae* species has been identified as the main factor of infection [7,10,11,16,17]. Firstly, Safae & Minasiyan, isolated and introduced this Species from strawberry in Iran [1]. The morphological differences, nucleus number variation, characteristics related to pathogenesis and physiological features among isolates of *R. solani* led to assumption that presumably there are more intraspecific groups within this species and for this reason, most of authors have tried to categorize *R. solani* species. Parmeter & Whitney [15] affirmed that morphology couldn't be reliable method to determine isolates known as *R. solani*. The use of anastomosis grouping has led to the better categorization and determination isolates of *R. solani* and *R. fragariae*.

The binucleate anastomosis groups, firstly, were introduced by Ogoshi & his colleagues in 1979. The research on isolated *Rhizoctonia*s of strawberry in the worldwide show that, *R. fragariae* belongs to three groups as AG-A, AG-G and AG-I [2,10,11].

III. MATERIALS AND METHODS

All of isolates were reviewed by Using of pathogenesis test in terms of pathogenesis method and its intensity. In order to Prepare inoculum, certain values of sand and rice bran (each Cellophane = 200 ml rice bran and 270 ml sand) along with about 77ml distilled water were added to each pack. All packs were sterilized in autoclave twice during two days and

then inoculated with four cake slices of any isolate. [10]. The bulk of each pot was 1500 ml and the inoculum rate used for each pot was considered 150 ml the peat-moss soil sterilized twice along with perlite, 400 ml was used for any pot. Then, healthy transplants of strawberry were planted with 800 ml of peat-moss-perlite mixture and 150 ml inoculum in pots. The five treatments without inoculum with same rate of peat-moss and perlite were considered as control. The pots were maintained under greenhouse conditions in max 21 and min 19 °C. The irrigation of pots was carried out regularly twice a week. Following about 2 months of transplants cultivation, the signs of infection were observed gradually in aerial organs. At the end of test, the plants were taken from soil and 5 roots of each plant selected randomly in order to determine infection intensity

and necrosis percent calculated through measuring total length and necrotic section length of any root [11]. To determine and anastomosis grouping of isolates, First, the isolates and testers were transferred to WA medium and after 48-72 h growth in given medium, small slice prepared from each isolate and tester and located on slide against each other in duplicate. The slides were transferred to petries containing wet and sterile filter paper and maintained at 48-72 h in 25 °C into incubator [14].

The produced hyphal cellules on the slide were stained by Safranin-O and observed in magnifications of 40, 200, 100, 400, 1000 of microscope. The isolates which their fungal rows linked with tester were belonged to the same anastomosis group.

IV. RESULTS AND DISCUSSIONS

As obtained results in reviews of most scholars such as Butha & his colleagues and Martine [2,10], the highest pathogenesis intensity in the present research is belong to *R. fragariae* species. The analysis of data variance showed that, there are meaningful difference among isolates in terms of decaying on 1% level. Thus, the means were compared and as a result, the isolates categorized in 25 groups. The isolates as SRM12/4 and SRT2/3 (related to Mazandaran and Alborz Provinces respectively) and isolate of SRM 13/8 (belong to Mazandaran Province) showed maximum and minimum pathogenesis intensity respectively.

Based on this test, all of reviewed isolates have led to occurrence of infection in root of strawberry and just only in the situation, with the lack of pathogenic factor and in Control Pots, the pathogenesis wasn't observed. The results of anastomosis groups review show that highest rate of

isolates belong to anastomosis group other than groups A and G.

In this grouping, the following results were obtained in relation with isolates of any province: From 13 isolates belonging to Mazandaran province, three isolates were belonged to anastomosis group A (AG-A), two isolate belong to anastomosis group G (AG-G) and anastomosis group of other isolates were unclear. Among 16 isolates belong to Golestan province, 8 isolates were belonged to AG-A and anastomosis group of remaining 8 isolates were also unclear.

The results of review and determination of anastomosis groups of 20 isolates of kordestan province showed, 4 isolates were belonged to AG-A, 4 isolates, AG-G and anastomosis group of other isolates were unclear. In Alborz province, also, from 10 isolates, 4 ones were belonged to AG-A, two ones AG-G and remaining 5 isolates with unclear anastomosis group. The results of anastomosis grouping of reviewed 60 isolates showed that, 31.66 percent of isolates belong to AG-A, 13.33 percent, to AG-G and 55 percent of isolates didn't categorized in known anastomosis groups. Also, reviews showed that highest number (42.10 percent) of isolates which belonged to AG-A were traced in Golestan province and lowest number (15.78 percent) in Mazandaran province. The highest number (50 percent) of isolates belonged to AG-G were related to Kordestan province and in Golestan province, the isolates belonged to this anastomosis group wasn't traced (Fig. 1).

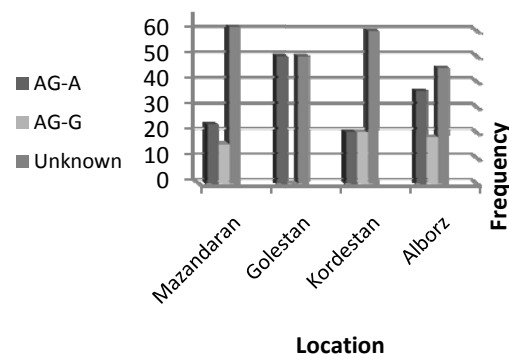


Fig. 1. Frequency of isolates belonging to reviewed anastomosis groups on four provinces

In most studies of other scholars [2, 10], the large number of isolates are belong to anastomosis group A. But in the present research, the results contrast with results of these researches were obtained which indicate various diffusiveness of anastomosis groups in different climates.

V. CONCLUSIONS AND RECOMMENDATIONS

Based on obtained results, in the present research, the isolates belong to reviewing anastomosis groups are observed in any of four provinces which are the main regions of strawberry production in Iran.

In order to determine varieties resistant to *Rhizoctonia fragariae* as the main factor of black root rot disease of strawberry, it appears necessary to review pathogenic factor in aspect of genetic diversity. Non-accessibility to tester of anastomosis group I, leads to restrictions in anastomosis grouping for isolates which their anastomosis group weren't determined. By access to this tester, determination of *R. fragariae* species varieties would be carried out significantly in Iran. With regard to that Pit-mass soil causes to discolor in the root of plant and consequently, review of necrotic sections resultant of infection involves more notice and time, the use of perlite as cultivation bed would lead to facilitation of diagnosis.

VI. REFERENCES

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