

EVALUATION OF CUMIN (*CUMINUM CYMINUM* L.) GENOTYPES AT DIFFERENT AGRO-ECOLOGICAL DOMAIN OF WESTERN NEPAL

Ranjana Rawal¹, Khem R.Sharma² and Ram Bahadur Khadka¹

¹ Scientist, RARS, Khajura, Banke, Nepal, Nepal Agricultural Research Council

² Technical Officer, Ginger Research Program, Kapurkot, Salyan, NARC

ABSTRACT

A field evaluation of five genotypes of cumin (*Cuminum cyminum* L.) was carried out at Regional Agriculture Research Station, Khajura, Nepalgunj and Ginger Research Program, Kapurkot, Salyan in 2014-15. The experiment was laid out in a Randomized complete block design with five treatment and four replications. Five genotype of cumin (Ratna, GC 4, Guha 104, RZ 209 and Sri Ram Gold) collected from Rajasthan, India were sown at 30cm X 5 cm spacing. Plant height, number of branch per plant, number number of umbel per plant, wilt and root rot disease incidence, seed yield and test weight were recorded. No yield and other yield attributing characters could be recorded in Khajura condition due to the high incidence of blight and root rot diseases. The number of umbel per plant was recorded significantly the highest in RZ-209 (36.35) while there was no significant different in number of umbeletes per umble among the tested varieties. The lowest disease was scored in variety Ratna (1) which was at par with Sri Ram Gold (1.5). The highest yield was recorded in genotypes Guha 104 (0.59 mt/ha) which was followed by Sri Ram Gold (0.53 mt./ha) at Salyan condition while the lowest seed yield was recorded in RZ 209 (0.32 mt/ha). This preliminary result showed that the feasibility of commercial cumin production in mid hill region of mid western Nepal while due to the high incidence of soil borne disease in terai region it is not possible without the appropriate disease management package in western terai region of Nepal.

Key words: cumin, seed yield, disease, western terai, varieties

Introduction

Cumin (*Cuminum cyminum* L.) the king of seed spices, is a member of family Apiaceae and grown in arid and semi arid region of India (Lal et al, 2011). In addition to its common use as spice in our daily life, recent studies have indicated its pharmaceutical and medicinal importance (Aruna and Sivaramakrishnan, 1996). It is a winter season (rabi) crop which is delicate, much branched, slow growing herbaceous attaining an average height of 15- 25cm. According to Spice Board India (2009), 70% of world production of cumin is contributed by India while the major consumers are China, Indonesia, Singapore, Malaysia, Bangladesh, Nepal and India itself.). The crop performs well between Temperature 15 to 25°C during growth and 20- 30 °C during flowering and ripening. However it requires dry weather during harvesting (SCDP 2008). In India cumin is sown in Oct - Dec whereas in Syria, Turkey and Iran it is sown during March - May (Spice Board India, 2010). October 15th date of sowing was more appropriate in terms of higher yield and quality under Salyan condition of Nepal (Rawal, 2014).

From cultivation point of view it is new crop in Nepal but it is used in Nepali kitchen as important ornament from ancient time. Unavailability of quality seeds in Nepal is one of the main causes for low adaptation among the farmers. In a very small scale some of the innovative farmers of Kavre, Nuwakot, Rupendehi, Rukum, Dang, Dadheldhura, Salyan and Surkhet districts have attempted to cultivate cumin for household consumption (SCDP 2008). In the fiscal year 2010-11, Nepal imported about 3984 ton of cumin from India, which worth of 29 crore of Nepali currency (MoAC 2010). Research activities for identification of appropriate location and climatic condition is necessary for successful cultivation of cumin in Nepal. The study aimed to determine suitable climatic condition and variety for cumin cultivation in western region of Nepal.

Materials and Methods

A field evaluation of five genotypes of cumin (*Cuminum cyminum* L.) was carried out at Regional Agriculture Research Station (RARS), Khajura, Nepalgunj and Ginger Research Program (GRP), Kapurkot, Salyan in 2014-15. GRP, Kapurkot is located at 82° 24' East longitudes and 28° 14' North latitude with altitude of 1480 masl while RARS, Khajura is located at 81° 37' E longitudes and 28° 06' N latitude and an altitude of 181 meters above mean sea level. The experiment was carried out from October, 2014 to April 2015.

Experimental Design and Cultural Practices

The experiment was laid out in a RCB design with 4 replications. Five varieties viz. Ratna, GC 4

Guha 104, RZ 209 and Sri Ram Gold were tested. The individual plot size was 4.41 m², gross plot area consisting 2.1 m length and 2.1 m breadth. Row spacing was 30 cm and plant to plant distance was 10 cm. The spacing between two blocks and main plot was 1 m and space between subplots was 0.5 m. After field preparation, FYM @ 10 t/ha and NPK @ 30:20:15 kg/ha was applied. Seeds were sown manually at the depth of 0.5 cm. Bavistin @ 2 gm per liter water was sprayed 2 times at reproductive stage to control fusarium wilt and blight. The disease scoring was done using 0-9 scale, where no disease was scored as 0 and the highest disease was scored as 9.

Plant Sampling and Statistical Analysis

Out of 7 rows, 2 rows were taken as boarder and remaining 5 rows were used for observation. Ten randomly selected plants from these five rows were taken for observation while yield data was taken from whole plot. Analysis of variance (ANOVA) was used to determine significant differences. The Multiple Range Test of Duncan performed the separation of means when the F-test revealed the error probability to justify the difference minor. All statistics were performed with the program MSTATC (Version 2.10) and SPSS (version 10.0).

Results and Discussion

In Khajura condition there was complete failure of research trial due to highest incidence of disease. At first cumin was sown in October 15 there after it was sown four times with one month interval in Khajura. But there was complete failure of cumin in all sowing date in Khajura condition due to higher incidence of disease like fusarium wilt and blight.

In case of Salyan, there was successful production of cumin. The plant height was found to

be significant among the tested varieties. The highest plant height was recorded in variety RZ 209(39.90) followed by Sri Ram Gold (37.95) and it was found to be lowest in GC4 (31.40). The mean plant height was 35.8 cm at Salyan conditions (Table 1). The result of this experiment is quite agreement with result obtained by Rawal et al. (2014) where the highest plant height was recorded in Sri Ram Gold (45.87 cm) and RZ209(45.61 cm) at November planting while it was lower in October planting.

Number of branch per plant and number of umbelletes per umbel was insignificant among the tested genotypes. The highest test weight was recorded in the genotypes Guha 104(1.96 gm) followed by Ratna (1.89 gm) and lowest was recorded in RZ 209 (1.72 gm). However the test weight was not significant different among the tested genotypes.

Table 1. Crop phenological and yield attributing characters of five cumin varieties at Kapurkot, Salyan, duing, 2014-15

Treatments	Plant height (cm)	No. of branch/plant	No. of umbel/plant	No of umbelletes per umbel	Yield per plot (gm)	Test weight (gm)	Disease	Yield (t/ha)
Ratna	37.70 ^{ab}	22.90	23.25 ^b	5.10	109.00 ^{ab}	1.89	1.00 ^b	0.52 ^{ab}
GC 4	31.40 ^b	23.93	25.02 ^b	5.23	86.75 ^{bc}	1.87	2.00 ^{ab}	0.41 ^{bc}
Guha 104	31.83 ^b	23.65	26.72 ^b	5.68	123.75 ^a	1.96	1.50 ^b	0.59 ^a
RZ 209	39.90 ^a	23.48	36.35 ^a	5.78	68.00 ^c	1.72	2.75 ^a	0.32 ^c
Sri Ram Gold	37.95 ^{ab}	25.30	23.67 ^b	5.03	111.75 ^{ab}	1.74	1.50 ^b	0.53 ^{ab}
Mean	35.8	23.85	27.00	5.36	99.8	1.84	1.75	0.48
SEM±	2.38	0.84	1.72	0.28	10.53	0.144	0.36	0.05
LSD _{0.05}	7.33	2.57	5.29	0.87	32.46	0.44	1.11	0.15
CV%	13.3	7.0	12.7	10.5	21.1	15.7	41.1	21.1

The seed yield of different varieties was significantly different among the tested varieties. The highest yield was recorded in Guha 104 (0.59 mt/ha) which was at par with Sri Ram Gold(0.53 mt/ha) and Ratna (0.52 mt/ha). While significantly the lowest seed yield was recorded in RZ 209 (0.32 mt/ha) which was at par with GC 4 (0.41 mt /ha). The mean yield of cumin at Kapurkot condition was 0.48 mt/ha (Table 1). This result is similar with result of Rawal et al. (2014) where the highest was recorded in Guha104 (0.79 mt/ha), at the same date of sowing. The higher yield of Guha 104 may be due lower disease incidence and higher other yield attributing characters.

The fusarium blight disease was also significant different among the tested varieties. The lowest disease was scored in variety Ratna(1) which was at par with Sri Ram Gold(1.5), while the highest disease score was recorded in the genotypes RZ209 (2.75) which was found to be followed by GC4(2.00).

Correlation Analysis Between Different Parameters

The correlation between different parameter recorded over the experiment was analyzed through SPSS program . Among them the strong correlation at 0.05 level was found between plant height and Umbelletes per umber and disease and umbel per plant. While the highly significant correlation at 0.01 level of significant was recorded between Yield and Disease score. However the correlation between other parameter was non-significant (Table 2).

Table 2. Correlation analysis between different parameter of cumin

Parameters	Yield per ha	Plant height	Branch per plant	Umbel per plant	Umbeletes per umbel	Seed yield plot	Test weight	Disease
Yield per ha	1							
Plant height	-0.367	1						
Branch per plant	0.332	0.065	1					
Umbel per plant	-0.420	0.251	-0.230	1				
Umbeletes per umbel	0.032	-0.520*	-0.223	0.345	1			
Seed yield plot	1.000**	-0.362	0.329	-0.421	0.024	1		
Test weight	-0.054	-0.131	0.028	-0.268	-0.175	-0.056	1	
Disease	-0.703**	0.035	-0.243	0.538*	0.407	-0.704**	0.194	1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis

The pattern of seed yield production was negatively attributed by higher fusarium blight incidence. Highly significant negative correlation between fusarium blight and yield ($r = 0.703^{**}$) was obtained (Fig 1). The regression analysis showed that the the contribution of disease to reduce seed yield was 70 % while 30 % was due to other parameter in the experiment.

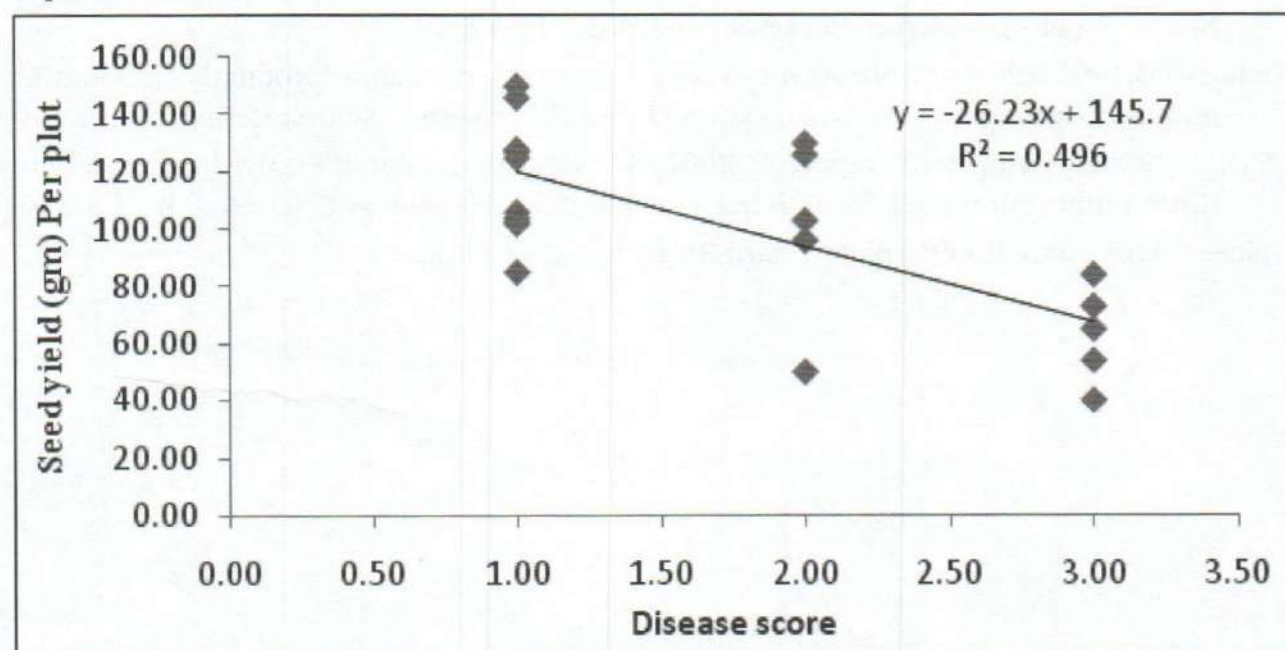


Figure 1. The regression analysis between disease score and seed yield

Conclusion

The high yielding and fusarium blight disease resistant varieties of cumin have the potential to improve plant survival percentage, yield components and seed spice yields. Of the tested variety Guha104 was superior in terms of yield and disease resistant under Salyan conditions. The variety can be promoted through multi-locations trials in the similar climatic condition for further verification.

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