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Research Article

Genetic variability, heritability, genetic advance, correlation coefficient and path analysis in *Ocimum basilicum* germplasms

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ABSTRACT

The present experiment was conducted with twenty germplasms of *ocimum* at College of Horticulture, Mandsaur, Madhya Pradesh in Randomized Block Design with three replications during the year 2019-20. This investigation revealed that, the phenotypic coefficient of variation was greater than the genotypic due to environmental effects on the expression of the characters. The more GCV was observed for essential oil in reproductive phase (44.28%) followed by essential oil in vegetative phase (43.00%). The maximum PCV observed for essential oil in reproductive phase (44.55%) followed by essential oil in vegetative phase (44.11%). The maximum heritability was observed in fresh weight (99.14%), genetic advance was in leaf area (4453.51) and genetic advance as percent of mean in essential oil at reproductive phase (90.41). Seed yield quintal per hectare was indicated significant and positive correlation with most of the traits. In genotypic and phenotypic path coefficient analysis all the parameters were shown positive significant direct effect on seed yield.

Keywords: Genetic variability, heritability, correlation coefficient, path analysis and *Ocimum* genus

INTRODUCTION

The genus Ocimum as a group called “basil” and “King of the herbs” belonging to the family Lamiaceae. It has around 50-150 species from the tropical areas of Asia, Africa and Central and South America. It is widely utilized due to its industrial, cosmetic culinary and medicinal significance (Erum et al., 2011) as well as the pharmaceutical industry. Basil has rich source of vitamins, carbohydrates, fibre, protein, phosphorous, calcium, iron, beta-carotene and several medicinal properties in essential oils (Meena et al., 2014 and). Eugenol, linalool, geraniol, citral, camphor, menthol chavicol, safrol, thymol, and methyl cinnamate are the major constituents of its oils (Kumar, 2012). It is take a height of 30-90 cm and is an erect, strongly aromatic yearly herbaceous plant with inverse, ovate-lanceolate, petioles very slender usually slightly hairy leaves, corolla is white, pink or pale-purplish in coloured and 0.72 - 1.25 cm long, flowers are conspicuous, black seeds and ellipsoid which become mucilaginous on moistening (Gingade et al., 2014). In the India, its cultivation and average yield of basil is low (Meena et al., 2016). It may be due to lack of suitable cultivars, genotypes and varieties to a particular region. In basil, the selection is based on fresh herbage, essential oil yield and oil quality along with their constituent characters which would prove very useful. There is urgent need for the evaluation of the genotypes to know their performance in terms of yield attributing and oil quality traits. The genus *Ocimum* is having the great variability among its constituent

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species (Svecova & Neugebauerov, 2010). Genetic variability, heritability and genetic advance are efficient selection practices for improvement of economic character to predict gain from selection and to establish the relative importance of genetic effect. The appearance of characters (phenotypes) is the result of genetic constitution of an individual (genotype) and the influence of the environment in which they are grown (Patel *et al*., 2015). This study of character associations has been envisaged to be an important strategy to design programmes to break negative genetic barriers to yield.

MATERIALS AND METHODS

The field research was carried out with twenty germplasms obtained from ICAR-AICRP on Medicinal and Aromatic Plants, College of Horticulture Mandsaur in Randomized Block Design during *kharif* season of 2019-20 under department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, RVSKVV, Mandsaur (M.P.). The experiment site Mandsaur is located at Malwa plateau in Western part of Madhya Pradesh at 23° 45' North to 24° 13' North and between the meridians of longitude 74° 44' East and 75° 18' East. In this study five plants were collected from each plot at 30, 60, 90, 120 days after transplanting and at harvest to recorded all the parameters and later on their mean was calculated. The experimental data were subjected to statistical analysis using analysis of variance technique suggested by Panse & Sukhatme (1985). Where the "F" test was found significant at 5 % level of significance, the critical differences for the treatment's comparison were worked out. The phenotypic and genotypic coefficient of variation was worked out as per Burton (1952), heritability and genetic advance were determined as per Johnson et al. (1955). The phenotypic and genotypic correlation coefficients were calculated as per the methods given by Al- Jibouri et al. (1958). Path co-efficient analysis suggested by Wright (1921) was carried out to know the direct and indirect effect of the morphological traits on plant yield.

S. No.	Germplasms/ Accession No.	Source
1.	G_1 IC-0622523	ACRIP on MAP COH Mandsaur (M.P.)
2.	G_2 IC-0622524	ACRIP on MAP COH Mandsaur (M.P.)
3.	G_3 IC-0622525	ACRIP on MAP COH Mandsaur (M.P.)
4.	G_4 IC-0622526	ACRIP on MAP COH Mandsaur (M.P.)
5.	G_5 IC-0622527	ACRIP on MAP COH Mandsaur (M.P.)
6.	G_6 IC-0622528	ACRIP on MAP COH Mandsaur (M.P.)
7.	G_7 IC-0622529	ACRIP on MAP COH Mandsaur (M.P.)
8.	G_8 IC-0622530	ACRIP on MAP COH Mandsaur (M.P.)
9.	G_9 IC-0622531	ACRIP on MAP COH Mandsaur (M.P.)
10.	G_{10} IC-0622532	ACRIP on MAP COH Mandsaur (M.P.)
11.	G_{11} IC-0622533	ACRIP on MAP COH Mandsaur (M.P.)
12.	G_{12} IC-0622534	ACRIP on MAP COH Mandsaur (M.P.)
13.	G_{13} IC-0622535	ACRIP on MAP COH Mandsaur (M.P.)
14.	G_{14} IC-0622536	ACRIP on MAP COH Mandsaur (M.P.)
15.	G_{15} IC-0622537	ACRIP on MAP COH Mandsaur (M.P.)
16.	G_{16} IC-0622538	ACRIP on MAP COH Mandsaur (M.P.)
17.	G_{17} IC-0622539	ACRIP on MAP COH Mandsaur (M.P.)
18.	G_{18} IC-0622540	ACRIP on MAP COH Mandsaur (M.P.)
19.	G_{19} IC-0622541	ACRIP on MAP COH Mandsaur (M.P.)
20.	G_{20} IC-0622542	ACRIP on MAP COH Mandsaur (M.P.)

RESULTS AND DISCUSSION

Genetic variability, heritability and genetic advance as a percent mean

Analysis of variance found that, there was estimated significantly variations among the germplasms for all the variables, except days to 50% germination. The variation indicated the presence of wide variability for all the traits studied under the experiment.

Genotypic and phenotypic coefficient of variation

The genotypic coefficient of variation in all the attributes was generally lower than the phenotypic, these study confirming the role of environment in total variability in a character. The presence of a broad range among genotypes indicated that, these traits were appeared by additive genes with low environmental effects Singh et

al. (2015). PCV and GCV were categorized by Sivasubramanian & Menon (1973). In the present study out of eighteen characters, the GCV was high for four, low for seven and moderate for the remaining traits (Table 1). The maximum amount of GCV was obtained for essential oil content at reproductive phase (44.22) followed by vegetative phase (43.00), leaf area (29.68) and 50% germination (21.30). These findings are accordance with Smita & Kishori (2018) for essential oil content in ocimum species. While, Singh et al. (2015); Gowda et al. (2019) are found same results for leaf area in ocimum species. The moderated GCV recorded with fresh herb yield (19.66) followed by dry herb yield (19.15), fresh weight (18.31), dry weight (17.67), seed yield quintal per hectare (16.91), number of inflorescence (13.87) and number of leaves (10.48). Similar results were found by Shakthi et al. (2021) for dry herb and fresh herb yield. However, the least GCV was observed for secondary branches (7.01), primary branches (6.33), flowers per inflorescence (5.69), plant height (3.96), 50% flowering (3.24) and maturity (3.59). These results were agreement by Ibrahim et al. (2013) for plant height and Smita & Kishori (2018) for flowering in ocimum species.

Heritability

Heritability is the proportion of the inconsistency among genotypic and phenotypic variance and helps breeder to understand variables for efficient selection Shakthi et al. (2021). The heritability defines different weather observations between individuals as variations in or due to environmental genetic makeup according to Smita & Kishori (2018). Heritability values are categorized as low (0-30%), moderate (31-60%) and high (>61%). The heritability was ranged between 19.15 to 99.14% (Table 1). However, it was the highest in fresh weight (99.14) followed by essential oil at reproductive phase (98.51) and vegetative phase (95.02), fresh herb yield (98.37), leaf area (97.89), leaves (91.53), secondary branches (87.89), dry weight (86.68), dry herb yield (86.15), seed yield quintal per hectare (85.27), inflorescence (81.97), 50% germination (80.83), primary branches (76.26), plant height (80.83), maturity (69.79) and 50% flowering (60.13). There would be less environmental and more genetic effect on the genotypes and variations between highest and lowest heritability values due to great and less environment impact (Patel et al., 2015). Higher heritability increase the efficacy of selection (Shukla et al., 2006 & Singh et al., 2018). The lower and higher values of variables may due to control by additive and non additive genes (Singh et al., 2015). These result had similarity with traits of Patel et al. (2015) in *ocimum* species. However, it was lowest for number of flowers per inflorescence (19.15).

Genetic advance

The data presented in the Table 1 indicated that, the genetic advance was ranged from 0.24 to 4,453.51. The highest value of genetic advance was obtained for leaf area (4453.51) followed by leaves (155.73), fresh weight (149.17), fresh herb yield (146.47), inflorescence (60.19), dry weight (35.37), dry herb yield (35.27), secondary branches (14.96), maturity (7.77), plant height (5.18), flowering (3.51), seed yield quintal per hectare (3.21), primary branches (1.63), essential oil at vegetative (0.362) reproductive phase (0.244) and flower per inflorescence (0.242). Higher genetic advance with heritability for these characteristics. This may be due to genetic advance in associated with heritability indicated traits additive genetic effect would be more significant for these traits as well higher heritability and which might the success of the progenies due to addictive gene effects (Blank et al., 2004). Similar findings were reported by Khan *et al*. (2019) in ocimum.

Genetic advance as percent of mean

Table 1 depicts that, the highest genetic advance as percent of mean was observed in essential oil at reproductive phase (90.41) followed by vegetative phase (86.35), leaf area per plant (60.49), fresh herb yield (40.16), days to 50% germination (39.45), fresh weight

Table 1: Estimation of GCV, PCV, heritability, genetic advance and GA as percent of mean for different characters of ocimum germplasms

Characters	Mean	Range		Coefficient of variation		Heritability (%)	Genetic advance	GA as % over mean
		Min.	Max.	GCV %	PCV %			
Days to 50% germination	7.47	11.00	4.00	21.30	23.69	80.83	2.95	39.45
Days to 50% flowering	67.87	74.00	62.00	3.24	4.18	60.13	3.51	5.17
Days to maturity	125.75	133.00	110.00	3.59	4.30	69.79	7.77	6.18
Plant height	75.41	81.32	67.23	3.96	4.70	70.94	5.18	6.87
No. of leaves	754.07	1002.60	620.70	10.48	10.95	91.53	155.74	20.65
No. of inflorescence	232.73	302.50	160.70	13.87	15.32	81.97	60.19	25.86
No. of Flowers per inflorescence	4.73	6.80	3.20	5.69	12.99	19.15	0.24	5.13
No. of primary branches	14.34	17.40	13.10	6.33	7.25	76.26	1.63	11.38
No. of secondary branches	110.44	124.80	92.80	7.01	7.48	87.89	14.96	13.55
Fresh weight	397.23	534.70	278.60	18.31	18.39	99.14	149.17	37.55
Dry weight	104.36	144.27	70.40	17.68	18.98	86.68	35.37	33.90
Leaf Area	7362.05	11977.63	3588.48	29.68	30.00	97.89	4453.51	60.49
Fresh herb yield	364.70	492.60	248.60	19.66	19.82	98.37	146.47	40.16
Dry herb yield	96.32	136.83	62.15	19.15	20.63	86.15	35.27	36.62
Seed yield quintal per ha	9.94	12.75	6.00	16.91	18.25	85.87	3.21	32.28
Essen. oil vegetative phase	0.28	0.58	0.05	43.00	44.11	95.02	0.24	86.35
Essen. oil reproductive phase	0.40	0.86	0.07	44.22	44.55	98.51	0.36	90.41

(37.55), dry herb yield (36.62), dry weight (33.90), seed yield quintal per hectare (32.28), number of inflorescence (25.86), number of leaves (20.65). These results were accordance with Smita & Kishori (2018) and Gowda et al. (2019). Under moderated genetic advance for number of secondary branches (13.55), number of primary branches (11.38) and low for days to 50% maturity (6.18), plant height (6.87), days to 50% flowering (5.17), and number of flowers per inflorescence (5.13). The estimate of genetic advance is more helpful as a selection criteria when examine jointly with heritability estimates. These attributes are likely to be controlled by the additive gene effect. Moreover, low genetic advance as a percent average of plant height exhibited heritability that variability is due to the role of non-additive gene and hence heterosis breeding could be effectively manipulated to improve yield-contributing parameters (Lal et al., 2017).

Genotypic and Phenotypic correlation coefficient

The genotype and phenotype correlations for various component as essential oil content (0.682 and 0.630), number of leaves (0.696 and 0.596), number of inflorescence (0.414 and 0.351), number of flowers per inflorescence (0.649 and 0.343), number of secondary branches (0.682 and 0.634), dry weight (0.692 and 0.578), leaf area (0.624 and 0.597) and dry herb yield (0.732 and 0.590) were shown significant and positive association with seed yield quintal per hectare whereas, negative and non-significant at both level for plant height and number of primary branches (Table 2). These findings are in associated with Shivanna et al. (2007) for dry herb yield per plant. A highly significant and positive correlation of leaf area and number of leaves per plants and essential oil content revealed the strong relationship with other traits and selection of these

Table 2: Phenotypic (Above diagonal) and genotypic (below diagonal) correlation coefficient among yield and yield attributing characters in different ocimum germplasms

Variables	PH	NL	NI	NF	NPB	NSB	DW	LA	LAI	LAD	CGR	RGR	DHY	SY	EOC
PH	**1**	0.094^{NS}	0.205^{NS}	-0.099^{NS}	0.027^{NS}	-0.087^{NS}	0.122^{NS}	0.215^{NS}	0.205^{NS}	0.205^{NS}	-0.034^{NS}	-0.025^{NS}	0.119^{NS}	-0.101^{NS}	0.341**
NL	0.102^{NS}	**1**	0.700**	0.358**	0.171^{NS}	0.565**	0.767**	0.784**	0.786**	0.786**	0.205^{NS}	0.306*	0.778**	0.596**	0.710**
NI	0.234^{NS}	0.853**	**1**	0.312*	0.091^{NS}	0.179^{NS}	0.500**	0.537**	0.527**	0.529**	0.002^{NS}	0.089^{NS}	0.569**	0.351**	0.533**
NF	-0.128^{NS}	1.106**	0.580**	**1**	0.230^{NS}	0.369**	0.344**	0.457**	0.448**	0.449**	0.035^{NS}	0.024^{NS}	0.374**	0.343**	0.286*
NPB	0.143^{NS}	0.216^{NS}	0.101^{NS}	0.222^{NS}	**1**	0.218^{NS}	0.024^{NS}	0.076^{NS}	0.099^{NS}	0.095^{NS}	0.072^{NS}	0.212^{NS}	0.060^{NS}	0.153^{NS}	0.228^{NS}
NSB	-0.153^{NS}	0.651**	0.146^{NS}	0.999**	0.306*	**1**	0.643**	0.607**	0.642**	0.642**	0.179^{NS}	0.228^{NS}	0.645**	0.634**	0.539**
DW	0.219^{NS}	0.860**	0.602**	0.824**	0.012^{NS}	0.753**	**1**	0.796**	0.800**	0.803**	0.523**	0.527**	0.935**	0.578**	0.664**
LA	0.275*	0.844**	0.591**	0.958**	0.074^{NS}	0.657**	0.875**	**1**	0.987**	0.987**	0.272*	0.255*	0.778**	0.582**	0.793**
LAI	0.252^{NS}	0.841**	0.581**	0.954**	0.104^{NS}	0.692**	0.875**	0.989**	**1**	0960**	0.255*	0.262*	0.784**	0.594**	0.794**
LAD	0.249^{NS}	0.842**	0.580**	0.954**	0.103^{NS}	0.691**	0.877**	0.989**	0.820**	**1**	0.256*	0.263*	0.786**	0.597**	0.795**
CGR	0.543**	0.666**	0.104^{NS}	0.635**	-0.066^{NS}	0.629**	0.706**	0.843**	0.785**	0.785**	**1**	0.729**	0.348**	0.104^{NS}	0.147^{NS}
RGR	0.291*	1.036**	0.497**	0.538**	0.850**	0.837**	0.823**	0.946**	0.929**	0.928**	0.933**	**1**	0.417**	0.126^{NS}	0.215^{NS}
DHY	0.168^{NS}	0.890**	0.647**	0.849**	0.037^{NS}	0.744**	1.018**	0.850**	0.853**	0.855**	0.756**	0.851**	**1**	0.590**	0.695**
SY	-0.183^{NS}	0.696**	0.414**	0.649**	0.211^{NS}	0.682**	0.692**	0.624**	0.635**	0.637**	0.440**	0.669**	0.732**	**1**	0.630**
EOC	0.405**	0.759**	0.583**	0.614**	0.259*	0.574**	0.720**	0.805**	0.804**	0.804**	0.387**	0.636**	0.743**	0.682**	**1**

** 1% level of significance * 5 % level of significance

PH- Plant Height, **NL**- Number of Leaves, **NI**- Number of Inflorescence, **NF**- Number of Flowers per inflorescence, **NPB**-Number of Primary Branches, **NPS**-Number of Secondary Branches, **DW**-Dry Weight, **LA**-Leaf Area, **LAI**-Leaf Area Index, **LAD**-Leaf Area Duration, **CGR**-Crop Growth Rate, **RGR**-Relative Growth Rate, **SY**-seed Yield quintal per hectare, **EOC**- Essential Oil Content

Table 3: Estimates of genotypic path coefficients analysis showing direct and indirect effect on seed yield per ha. in ocimum germplasms

Variables	**Genotypic Path Matrix**														
	PH	**NL**	**NI**	**NF**	**NPB**	**NSB**	**DW**	**LA**	**LAI**	**LAD**	**CGR**	**RGR**	**DHY**	**EOC**	**rG**
PH	**-0.74**	0.05	0.032	0.12	-0.097	0.609	-0.167	-0.024	6.598	-6.582	0.046	0.219	0.063	0.391	-0.183^{NS}
NL	-0.075	**0.492**	0.115	-1.038	-0.146	0.397	-0.654	-0.072	22.048	-22.273	0.057	0.779	0.332	0.733	0.696**
NI	-0.173	0.42	**0.135**	-0.544	-0.068	0.089	-0.458	-0.005	15.218	-15.341	0.009	0.374	0.241	0.563	0.414**
NF	0.094	0.545	0.078	**-0.938**	-0.15	0.609	-0.626	-0.082	24.985	-25.235	0.054	0.405	0.317	0.592	0.649**
NPB	-0.106	0.106	0.014	-0.208	**-0.676**	0.186	-0.009	-0.006	2.724	-2.713	-0.006	0.639	0.014	0.251	0.211**
NSB	0.113	0.321	0.02	-0.938	-0.207	**0.609**	-0.572	-0.056	18.144	-18.268	0.054	0.63	0.278	0.544	0.682**
DW	-0.162	0.424	0.081	-0.773	-0.008	0.459	**-0.76**	-0.075	22.938	-23.185	0.06	0.619	0.38	0.695	0.692**
LA	-0.203	0.416	0.08	-0.898	-0.05	0.4	-0.665	**-0.085**	25.912	-26.16	0.072	0.711	0.317	0.777	0.624**
LAI	-0.186	0.414	0.078	-0.894	-0.07	0.422	-0.665	-0.085	**26.204**	-26.442	0.067	0.699	0.319	0.776	0.635**
LAD	-0.184	0.415	0.078	-0.895	-0.069	0.421	-0.666	-0.085	26.204	**-26.442**	0.067	0.698	0.319	0.777	0.637**
CGR	-0.402	0.328	0.014	-0.595	0.044	0.383	-0.536	-0.072	20.582	-20.749	**0.085**	0.702	0.282	0.374	0.440**
RGR	-0.215	0.51	0.067	-0.505	-0.575	0.51	-0.625	-0.081	24.351	-24.532	0.08	**0.752**	0.318	0.614	0.669**
DHY	-0.125	0.438	0.087	-0.797	-0.025	0.453	-0.773	-0.073	22.358	-22.608	0.065	0.64	**0.377**	0.718	0.732**
EOC	-0.300	0.374	0.078	-0.576	-0.175	0.35	-0.547	-0.069	21.063	-21.271	0.033	0.479	0.277	**0.965**	0.682**

PH- Plant Height, **NL**- Number of Leaves, **NI**- Number of Inflorescence, **NF**- number of Flowers per inflorescence, **NPB**- Number of Primary Branches, **NPS**- Number of Secondary Branches, **DW**-Dry Weight, **LA**-Leaf Area, **LAI**-Leaf Area Index, **LAD**-Leaf Area Duration, **CGR**- Crop Growth Rate, **RGR**-Relative Growth Rate, **SY**- Seed Yield quintal per hectare, **EOC**- Essential Oil Content.

***Direct effect is represented as bold letters**

Table 4: Estimates of phenotypic path coefficients analysis showing direct and indirect effect on seed yield quintal per ha in ocimum germplasms

Variables	**Phenotypic Path Matrix**														
	PH	**NL**	**NI**	**NF**	**NPB**	**NSB**	**DW**	**LA**	**LAI**	**LAD**	**CGR**	**RGR**	**DHY**	**EOC**	**rP**
PH	**-0.255**	0.013	-0.007	-0.004	0.001	-0.021	0.004	-0.019	-1.034	1.025	0.002	0.004	-0.018	0.167	-0.101^{NS}
NL	-0.024	**0.137**	-0.023	0.013	0.005	0.135	0.277	-0.070	-3.960	3.930	-0.010	-0.046	-0.116	0.348	0.596**
NI	-0.052	0.096	**-0.032**	0.011	0.003	0.043	0.181	-0.048	-2.654	2.642	0.000	-0.013	-0.085	0.261	0.351**
NF	0.025	0.049	-0.010	**0.037**	0.007	0.089	0.124	-0.041	-2.259	2.244	-0.002	-0.004	-0.056	0.140	0.343**
NPB	-0.007	0.023	-0.003	0.008	**0.029**	0.052	0.009	-0.007	-0.496	0.477	-0.004	-0.032	-0.009	0.112	0.153^{NS}
NSB	0.022	0.078	-0.006	0.014	0.006	**0.240**	0.232	-0.055	-3.232	3.210	-0.009	-0.034	-0.096	0.264	0.634**
DW	-0.031	0.105	-0.016	0.013	0.001	0.154	**0.362**	-0.072	-4.031	4.014	-0.026	-0.080	-0.140	0.325	0.578**
LA	-0.055	0.108	-0.017	0.017	0.002	0.146	0.288	**-0.090**	-4.972	4.936	-0.014	-0.038	-0.116	0.388	0.582**
LAI	-0.052	0.108	-0.017	0.016	0.003	0.154	0.290	-0.089	**-5.036**	4.998	-0.013	-0.040	-0.117	0.389	0.594**
LAD	-0.052	0.108	-0.017	0.016	0.003	0.154	0.290	-0.089	-5.035	**4.999**	-0.013	-0.040	-0.117	0.389	0.597**
CGR	0.009	0.028	0.000	0.001	0.002	0.043	0.189	-0.024	-1.284	1.280	**-0.050**	-0.110	-0.052	0.072	0.104^{NS}
RGR	0.006	0.042	-0.003	0.001	0.006	0.055	0.191	-0.023	-1.318	1.314	-0.036	**-0.151**	-0.062	0.105	0.126^{NS}
DHY	-0.030	0.107	-0.018	0.014	0.002	0.155	0.338	-0.070	-3.946	3.929	-0.017	-0.063	**-0.149**	0.341	0.590**
OC	-0.087	0.098	-0.017	0.010	0.006	0.129	0.240	-0.071	-3.997	3.972	-0.007	-0.033	-0.104	**0.490**	0.630**

PH- Plant Height, **NL**- Number of Leaves, **NI**- Number of Inflorescence, **NF**- number of Flowers per inflorescence, **NPB**- Number of Primary Branches, **NPS**- Number of Secondary Branches, **DW**-Dry Weight, **LA**-Leaf Area, **LAI**-Leaf Area Index, **LAD**-Leaf Area Duration, **CGR**- Crop Growth Rate, **RGR**-Relative Growth Rate, **DHY**- Dry herbage yield, **EOC**- Essential Oil Content.

***Direct effect is represented as bold letters**

component traits individuals or jointly may enhance the total herbage yield, and oil yield per hectare in ocimum species.

Path coefficient analysis for yield and yield attributing traits

The result of path coefficient analysis revealed positive direct effect with dry herb yield followed by oil content in genetic effect association with seed yield. Thus, direct selection for these factors would increase in significant amount of yield. Similar suggestions made by Baslma (2008). The negative and ranged from moderate to low magnitude of direct effect was exhibit by characters leaf area, number of primary branches per plant had association with seed yield in genetic and phenotypic levels of analyses (Table 3 & 4). These results were harmony with Ibrahim et al. (2013) in ocimum species. The positive direct effects with essential oil content on seed yield. This result was manifested by (Kumar et al., 2012) in ocimum crops. Likewise, indirect effects through studied traits with oil yield showing from negative or positive and was found to vary from moderate to very low.

CONCLUSION

High level of variability was associated with the twenty germplasm of ocimum which is creating the scope of further improvement in hereditary of ocimum germplasms. The GCV was higher than the PCV which concludes that environmental effect on expression. The highest heritability was observed in fresh weight while, the highest genetic advance was recorded in leaf area. Most of the characteristics were shown significant positive association and path coefficient analysis in both the levels with seed yield. On the basis of this research, it could be concluded that the germplasms G_{14} IC-0622536 and G_{19} IC-0622541, should be used for further breeding programme.

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