ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 03, pp. 27195-27197, March, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

STUDY ON VARIABILITY IN FIELD EXPERIMENTS OF ISUBGUL CROP

***Motaka, G. N., Parmar, D. J., Kalola, A. D., Darji, V. B. and Vaishnav, P. R.**

Department of Agricultural Statistics, Anand Agricultural University, Anand-388 110, India

ARTICLE INFO

Article History:
Received 14th December, 2015
Received in revised form
20th January, 2016
Accepted 25th February, 2016
Published online 16th March, 2016

Key words:
CV%, Fiducial limit,
Plot size,
Non central t distribution,
Experimental variability.

ABSTRACT

The data on C.V. % for Isabgul crop yield along with other details of 159 field experiments conducted during 1989-90 to 2011-12 at Main Research Station, Medicinal and Aromatic crop, Anand Agricultural University, Anand were collected and analyzed. The frequency distribution tables were prepared for various experimental factors. The upper fiducial limits (the yardstick) of C.V.% at 95% confidence based on non central't' distribution were worked out for accepting the results of isubgul crop experiments which emerged as 23%.

Citation: Motaka, G. N., Parmar, D. J., Kalola, A. D., Darji, V. B. and Vaishnav, P. R. 2016. "Study on variability in field experiments of Isubgul crop", *International Journal of Current Research,* 8, (03), 27195-27197.

INTRODUCTION

In agricultural field experiments variation occurs due to uncontrolled factors such as soil fertility, climatic factors etc. and controlled factors such as field layout, treatments, replications, plot size etc. Such factors play an important role in the precision of the experimental results. C.V. % of the experiment is considered as a reliable index of variability for accepting or rejecting experimental results. Study on variability of large number of experiments help to develop the yardstick of CV% for field experiments. The present investigation was carried out with the objectives to study the experimental factors viz. disciplines, design, replications, treatments and plot sizes responsible for variability and to develop yardstick for reliability of the experimental results of isubgul crop experiments.

MATERIAL AND METHODS

The secondary data on C.V.% Medicinal and aromatic crop yield of 159 field experiments conducted at Main Research Station, Medicinal and Aromatic crop, Anand Agricultural University, Anand during 1989-90 to 2011-12 in plant breeding, agronomy, plant protection, plant physiology and plant pathology disciplines on different isubgul crop were utilized for the variability study. Information on plot size, number of treatments, replications, experimental design and disciplines was collected for each experiment. The data were analyzed to estimate error mean square and thereby C.V. % of each experiment (Snedecor and Chocran, 1967). Tyagi *et al.* and Patel *et al.* pointed out that C.V. obtained for the crops under study was found to be considerably higher than those reported from the uniformity trials. They stated that the yardstick for accepting experimental results should be worked out using C.V. observed in the experiments rather than in the uniformity trials. Bajpai and Nigam suggested a working rule for deciding the value of W_2 (weight corresponds to precision of the experiments) and developed an index to evaluate agricultural field experiments statistically.

Gomez and Gomez reported that C.V. varies greatly with the type of experiment, the crop grown and the character measured. They pointed that the acceptable range of C.V. is 6% to 8% for varietal trial, 10 to 12 % for fertilizer trials and 13 to 15 % for insecticidal and herbicidal trials on rice. The upper fiducial limit of C.V. % at 95% confidence level based on non central't' distribution (Johnson and Welch, 1939) was worked out on the basis of overall average C.V. % of 159 experiments in the present study, which was considered as yardstick of C.V. % for field experimentation on isubgul crop at Anand.

****Corresponding author: Motaka, G. N.***
Department of Agricultural Statistics, Anand Agricultural University, Anand-388 110, India.

Table 1. Upper fiducial limit of C.V. % for different disciplines of Isabgul crop

Discipline	No. of experiments	C.V. %	U L (0.05)	U L (0.10)	Range (0.05)	Range (0.10)	C.V. % > 22.39 No.of exp.	C.V. % > 22.39 Proportion
Agronomy	29	19.87	26.03	24.46	6.15	4.58	12	0.41
Pl.Breeding	106	16.30	21.42	20.10	5.13	3.81	27	0.25
Pl. physio	03	24.40	33.09	30.80	8.69	6.40	2	0.66
Pl.Protection	02	11.74	13.57	13.15	1.84	1.42	0	00
Pl.patho	19	16.44	21.47	20.19	5.03	3.75	1	0.05
Average	159	17.06	22.39	21.02	-	-	-	-

Table 2. Upper fiducial limit of C.V. % for different design of Isabgul crop

Design name	No. of experiment	Average C.V.%	Upper limit (0.05)	Upper limit (0.10)	Range (0.05)	Range (0.10)	C.V. % > 22.39 No. of exp.	C.V. % > 22.39 Proportion
FRBD	12	18.71	23.40	22.26	4.69	3.55	5	0.41
RBD	141	16.96	22.37	20.97	5.41	4.01	37	0.26
SPT	06	16.23	20.96	19.79	4.73	3.55	0	00
	159	17.06	22.39	21.02	-	-	-	-

Table 3. Upper fiducial limit of CV % for different treatments of Isabgul crop

Treatments	No. of experiment	CV %	U L (0.05)	U L (0.10)	Range (0.05)	Range (0.10)	CV % > 22.39 No. of exp.	CV % > 22.39 Proportion
Upto 5	28	18.35	25.21	23.41	6.86	5.06	7	0.25
6-10	101	17.45	22.90	21.50	5.45	4.05	31	0.30
11-15	28	14.75	18.37	17.48	3.62	2.73	4	0.14
16-20	1	11.74	13.57	13.15	1.84	1.42	0	00
Average	159	17.06	22.39		-	-	-	-

Table 4. Upper fiducial limit of CV % for different plot size of Isabgul crop

Plot size (m^2)	No. of experiment	CV %	U L (0.05)	U L (0.10)	Range (0.05)	Range (0.10)	CV % > 22.39 No.of exp.	CV % > 22.39 Proportion
<3	28	18.51	24.92	23.24	6.42	4.73	10	0.35
3-6	22	14.46	19.24	18.01	4.78	3.55	05	0.22
6-9	72	16.58	21.49	20.24	4.91	3.66	17	0.23
9-12	15	18.49	23.97	22.57	5.49	4.09	03	0.20
12-15	15	22.23	29.38	27.55	7.15	5.32	07	0.46
15-18	7	10.29	13.08	12.37	2.79	2.08	00	00
Average	159	17.06	22.39	21.02	-	-	-	-

Table 5. Upper fiducial limit of CV % for different replications of Isabgul crop

Replication	No. of experiment	CV %	U L (0.05)	U L (0.10)	Range (0.05)	Range (0.10)	CV % > 22.39 No.of exp.	CV % > 22.39 Proportion
3	77	15.49	20.34	19.09	4.85	3.60	16	0.20
4	63	18.28	23.90	22.46	5.62	4.18	21	0.33
5	05	25.06	32.74	30.79	7.69	5.73	03	0.60
6	05	16.40	22.46	20.87	6.06	4.47	00	00
8	03	21.35	28.88	26.91	7.52	5.55	02	0.66
10	06	16.23	20.96	19.79	4.73	3.55	00	00
Average	159	17.06	22.39	21.02	-	-	-	-

RESULTS AND DISCUSSION

The results presented in Table 1 revealed that mean C.V. % (17.06) and upper fiducial limit (22.39) of average value of all the discipline except for plant physiology and agronomy discipline, were below the mean C.V. %. The experiments on agronomy and plant physiology showed large variation (average CV = 19.87 % and 24.40 %) respectively showed poor precision may be because of experimental requirements such as sample size, natural population of pests and diseases. Use of proper statistical tools may help to improve the precision of the results.

More than 50% experiments of this disciplines had more than 22.39%. The results presented in Table 2 indicated that most of the experiments were carried out in RBD and FRBD and about 25 % of them had C.V. % higher than the fiducial limit worked out. This proportion was about 41% in other designs (Except RBD and SPT). Influence of number of treatments was also examined and results are given in (Table 3) according to different treatments group. Up to 5 and 6-10 treatments in an experiment showed higher C.V. % than the overall average (17.06%). Generally increased number of treatments in the experiments increases blocks (replication) size which increases error variance, affecting the precision of the results.

Table 6. The average upper fiducial limit and yardstick for CV % for the experiments of Isabgul crop

Name of Crops	No.of experiments	Mean CV %	Upper fiducial limit of CV %		Overall yardstick of CV%
			0.95	0.90	
Isabgul crop	159	17.06	22.39	21.02	23 %

Table 7. Power of F-test as influence by CV%

Class CV%	No. of experiments	F-test		
		Significant	Non-Significant	Ratio
3.35-8.35	31	17	14	0.82
8.35-13.35	32	12	20	1.67
13.35-18.35	38	18	20	1.11
18.35-23.35	23	13	10	0.77
23.35-28.35	14	4	10	2.50
28.35-33.35	12	7	5	0.71
33.35-38.35	7	*2*	*5*	*2.50*
38.35-43.35	1	0	1	**
43.35-48.35	0	0	0	**
48.35-53.35	1	0	1	**
>75	0	0	0	**
Total	159	73	86	1.18

Therefore, it is advisable to use such experimental designs (when treatment exceeds 16) which can help in controlling within block variation. Other means such as optimum plot size, more number of replications, proper site of the experiment etc. need to be considered. About 25 to 30 per cent experiments showed higher C.V. % compared to the overall average C.V. % except the treatment group 11-15. The results presented in (Table 4) indicated that the average C.V.% for different plot size experiments were below the average C.V.% (17.06) in plot size 3 to 9 sq.mt. Beyond 9 sq.mt. plot size the proportion of C.V.% having higher C.V.% increased from 0.20 to 0.46 Therefore, plot size of 3 to 9 sq.mt. Seems to be an optimum plot size for isabgul crop. Therefore, this needs to be confirmed by plot technique study for different locations. As far as replications are concerned, the experiments conducted with 4, 5 and 8 replications showed large variation 33, 60 and 66 per cent experiments showed C.V. > 22.39 respectively (Table 5). Analysis showed that majority experiments were conducted with 3 and 4 replications in field experiments on isabgul in which about 33 percent were having C.V. % > 22.39.

Yardstick of C.V. % for Isabgul crop field Experiments

The C.V. % data of 159 field experiments were used to fit non central 't' distribution and to work out upper confidence limit of C.V. at 0.05 level of probability. According the upper fiducial limit of C.V. % at 95 percent confidence level of C.V. % was worked out to be 22.39 per cent. Thus the results suggested that about 23 percent C.V. % should be considered as a yard stick for Medicinal and Aromatic crop field experiments. These having C.V. % > 23 should be rejected for drawing scientific conclusion. The power of F test was examined with the non significant/ significant ratio of experiments (Table 7).

The results revealed that the ratio consistently increased with the increase in C.V. of the experiments. It also indicated that the efficiency (of detecting difference in treatment means) of F-test decreased with the increase in C.V. of experiments. The average ratio was observed to be 1.18. The ratio for the class 13.35-18.35 % was almost equal to the average ratio which included 17.06 %, the mean C.V. of all experiments Results clearly showed that when the coefficient of variation in Isabgul crop field experiments exceeds 23 %, the experimental finding should not be considered for scientific purpose.

Acknowledgement

The reports provided by Research Scientist, Medicinal and aromatic project, Anand Agricultural University, Anand.

REFERENCES

Bajpai, S. N. and Nigam, A. K. 1980. Statistical evaluation of Agricultural field experiments. *J. Indian Soc. Agric. Stat.*, 32 (2): 41-45.

Gomez, K. A. and Gomez, A. A. 1984. Statistical procedure for Agricultural workers, John Wiley and Sons, New York, 2nd ed.

Johnson, N. L. and Welch B. L. 1939. Application of noncentral t-distribution. *Biometrika*, 31: 362-389.

Patel, N. M., Prajapati, M.R. and Prajapati, K. H. 1978. Paper presented at XVII Annual conference of Gujarat Statistical Association, Anand, November, 4-5.

Snedecor, G. W. and Cochran W.G. 1967. Statistical Methods. (*Sixth Edition)*, Oxford and IBH Pub. Co., New Delhi.

Tyagi, B. N., Kathuria, O.P., Sahni, M. L. and Kulharni, G.1973. A study of coefficient of variation associated with plots and blocks of different sizes for some important field crops. *J. Indian Soc. Agric. Stat*., XXV (II), 37-47.

****