vkf'kd çfr—fr vfHkdYiukvkadh l jpuk fof/k

,y-,u- fou;dqekj[1] fluh oxhZl[1] lhek tXxh[2] ,Y/kks oxhZl[3] ekgEen gk#u[1]
lk;rauh dekdj[1] nosUæ dqekj[1]

l kjkak

i"BHwfe%iksS{kkadsçtuu dk;ØekaeaçkjfHkd ih<h dsçtuu ijh{k.k ½EGBTs½ cgqr egRoiw.kZ gSA vf/kdrj ekeykaesa cgqr de miyC/k l l k/kukadsl kFk cMh l a[;k esaçtuu ykbuksadk ijh{k.k djuk gkrk gS] vkSj bu ijh{k.kksadksdbZ okrkoj.kkaesankgjkus dh Hkh vko';drk gkrh gSA ,sl ijh{k.kksadsfy,] vkf'kd : i l sçfr—fr vfHkdYiuk ,d fodYi ds: i esagS] tgkaçR;sd i;kZoj.k esaijh{k.k ykbZukadsvuqikr dksnkgjk;k tkrk gSA

fof/k;k¡% ;gka çkjfHkd [k.Mkadsek/;e l sleku [k.M vkdkjkaesa EGBTs dsfy, n{k vkf'kd : i l sçfr—fr vfHkdYiukvkadh ,d Jà[kyk dh l jpuk grq,d l kekU; fof/k fodfl r dh xbZgSA

ifj.kke% lHkh okrkoj.kkadks,d l kFk ysrsgq,] çkIr vfHkdYiuk,aleku&çfr—fr gSrFkk vkf'kd : i l slarqfyr gSA os l k/kukadsmkekysesaykxr çHkkoh gSD;kafd mUgade çfr—fr dh vko';drk gkrh gSA

"Kku dqath% çkjfHkd ih<h dsçtuu ijh{k.k] cgq&i;kZoj.k ijh{k.k] vkaf'kd : i l sçfr—fr vfHkdYiuk,] vkaf'kd : i l slarqfyrA

A Method of Constructing p-rep Designs

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ABSTRACT

Background: Early generation breeding trials (EGBTs) are very important in plant breeding programmes. In most cases, a large number of breeding lines are to be tested, often with very few available resources and it is also required to repeat these trials in a number of environments. For such trials, an alternative is to use partially replicated designs, where a proportion of the test lines are replicated at each environment.

Methods: Here, a general method of constructing a series of efficient partially replicated designs for EGBTs in equal block sizes, through initial blocks is developed.

Result: Taking all environments together, the designs obtained are equi-replicate and are partially balanced. They are cost effective in terms of resources as they require lesser replications.

Key words: Early generation breeding trials, Multi-environmental trials, Partially balanced, Partially replicated designs.

ifjp;

cgqi;kZoj.k ijh{k.k dk mi;ksx vDl j ikni çtuu esa fofo/k y{; {kes- esavyx&vyx i;kZoj.kh; ifjfLFkfr;ksesaykbZukadk eW/;kadu djusdsfy, fd;k tkrk gSA çtud ,d ,sl h vfHkdYiuk pqquk pkgxk tksvkuqofk'kd ykHk dks vf/kdre djsrkfd miyC/k l l k/kukadk mi;ksx ikni çtuu ijh{k.kkadsvk;kstu dksnk§ku ;FkklEHko n{krk l s fd;k tk l dA ;g çkjfHkd ih<h dsçtuu ijh{k.kkads ekeysa tgkal l k/ku nqyYHk gS] fo'ks"kk : i l s gh gSA ubZ ykbZuka;k ijh{k.k ykbZukadh l{;k vi{kk—r cMh gkrh gS] ç;ksx dsfy, çnku dh xbZvkuqofk 'kd l kexh ijh ijh{k.k

ykbLukadks ,d IkFk nkggjkusdsfy, vi;Kr gksldrh gS
vkj bI Is{ks= dh deh gksldrh gA dbZ'kksfkdrkZvkaus
ikni&çtuu dk;Øeka ea fxM&ly,V vfHkdYiukvka ds
mi;kx ij tkj fn;k gA osiä&Lrük vfHkdYiuk,agStks
Kkr 0;kol kf;d fdLekadh çfr—fr dk mi;kx djrh gS
fdLeka,oafcuk çfr—fr okysijh{k.k dh ykbLukadh tkp
djrs gS¼dEiVu½ 1982¼A fxM&ly,V vfHkdYiukvka ds
fodYi ds: i ebdfyl bR;kfn ½2006½usgy fd, x,
iä&Lrük vfHkdYiukadksçLrkfor fd;k] ftUgamUgkaus
vkf'kd : i Isçfr—fr vfHkdYiuk,adgk] tgka ijh{k.k
ykbLukadh p% dkstkp fdLekadksçfrLFkkfir djusdsfy,
çfr—fr fd;k tkrk gA

vkf'kd : i Isçfr—fr vfHkdYiuk,a fxM&ly,V
vfHkdYiukvka dh r;uk ea çtuu ykbLukads p;u grq
IVhdrk ealdkkj djrs gA gky dso"kkea'kksfkdrkZvkaus
ikni çtuu dk;Øeka ea vkf'kd : i Isçfr—fr
vfHkdYiukvka ds mi;kx ij tkj fn;k gA vukt dh
xqko Ükk ijh{k.k dsfy,] fLeFk bR;kfn ½2009½us vkf'kd
: i Isçfr—fr vfHkdYiuk dk çLrko fn;kA ;g vukt
dh mit vkj vukt dh xqko Ükk dsy{k.kk}nkukadsfy,,
n{k fefJr e,My fo'ys"k.k dsmi;kx dksl{ke cukrk gA
DykdZ vkj LVØkukok ½2011½ }kjk çkjHkd ih<+dsçtuu
ijh{k.k dsfy, b"Vre vfHkdYiuk ftleafcuk çfr—fr ;k
dpy vkf'kd : i Isçfr—fr ijh{k.k js{kk,¡ IfEefyr gS
fodffl r fd, x, FkA fofy;EI bR;kfn ½2011½ }kjk n{k
vkf'kd : i Isçfr—fr vfHkdYiuk dsfy, ,d Iäpuk
çfØ;k çkjEHk dh xbZgStks α- Ij.kh Isvo;okdksgVkus
ij vk/kkfjr gA fofy;EI bR;kfn ½2014½us vkf'kd : i Is
çfr—fr vfHkdYiukvka ds puko ea vf/kd yphyiu dh
vuqefr nsusokysvkf'kd : i Isçfr—fr vfHkdYiukvka ds
vf/kd 0;kid oxZ dh Iäpuk djus dsfy, bI —f"Vdks.k
dks vkj vkxs c<+r;kA bI ds vfrfjä] ekgfjax bR;kfn
½2014½usVkbfVdly vkj eDdk dsçkjHkd ih<+dsçtuu
ijh{k.k vkf'kd : i Isçfr—fr vfHkdYiuk dsçn'kZu dk
v/;;uA fi,Qks bR;kfn ½2016½ us n'kkZ;k gS fd dlÍ s
LFkkfud fopj.k&Igçl j.k Ijpukvka dk mi;kx vkf'kd
: i Isçfr—fr vfHkdYiuk Ifgr Ieku vkj vIeku
: i Isçfr—r vfHkdYiukvka dsfy, ijs{k= eamipkj
çfr—fr dsvf/kd Imku forj.k dksçkIr djusdsfy,,
fd;k tk Idrk gA gk: u bR;kfn ½2016a]b½us ijh{k.k

cuke uo&fufeZr ykbLuka,oaijh{k.k ykbLukadschp eV;kdu
grqiukxZ ,oavkf'kd f=&iFkk Ø,l vfHkdYiukvkadh fuekZk
fof/k fodfls r dh gA gky ghealdfyl bR;kfn ½2020½us
34 'kh?kzpj.k dsijh{k.kkadk ,d dsI LVMh çLrqr fd;kA
bI dscdn] Ieäjuh bR;kfn ½2020½usçkjHkd ih<+dsçtuu
ijh{k.k dsfy, vkf'kd : i Isçfr—fr vfHkdYiuk rStkj dj
ijh{k.k.kkRed fLFkfr;kadh ,d foLrrr Jä[kyk dsfy, etcwr
vfHkdYiukvkadh igpku djusdsfy,, vuq irkijh{k.k fd;kA

bI ys{keaage çjktHkd ih<+dsçtuu ijh{k.k dsfy,,
n{k vkf'kd : i Isçfr—fr vfHkdYiukvka dh ,d Jä[kyk
cukusdsfy,, ,d i)frçLrqr djrsgA bu vfHkdYiukvka
dsekindMkadk Hkh v/;;u fd;k x;k gA

çkjHkd

bI [k.M ealjipuk fof/k dscdkjseappkZdjusIsigysdN
egRoiwkZ ifjHkk"kk,¡ ,oaçkjHkd tkudkjh nh xbZgA

fpà i)fr

eku ykfft, fd ,d ijh{k.k dk bZokrkoj.kkeaçfr—r fd;k
x;k gA ;gk¡ç;ä ldru fuEufyf[kr gav¾ykbLukadh I{;k]
e¾i;kZoj.k dh I{;k] b¾[k.Mkadh I{;k] r¾çfr—fr dh
I{;k vkj κ¾viukZ[k.Mkadk vfíre vkdkjA

vkf'kd : i Isçfr—fr vfHkdYiuk,a

vkf'kd : i Isçfr—fr vFkok p–rep vfHkdYiuk,a,Lh
vfHkdYiuk,agkrh gSftuea çtuu ijh{k.k IfEefyr gkrh
gSvkj ftUgaiä;si;kZoj.k eaçfr—fr fd, tkusdh vko';drk
gkrh gSvkj çR;sd i;kZoj.k eaykbLukads p çfr'kr dks
çfr—fr fd;k tkrk gA tc e ifjoä'k gkrsgArksdkbZ,d
ifjoä'k eaçfof'V;kadks½¼1/e½voaHkkx dksbI çdkj çfr—fr
fd;k tk Idrk gSfd çR;sd çfof'V dk ijh{k.k e ifjoä'kka
eals,d ealnksçfr—fr ds IkFk fd;k tkrk gA bu
vfHkdYiuka Isv¡U; vfHkdYiukvka dh r;uk eaçtuu
ykbLukadsp;u dh IVhdrk eall/kkj gkusdh IHkkouk gA

e,My ,oaijh{k.kkRed foU;kl

vkf'kd : i Isçfr—fr vfHkdYiukvka dh fLFkfr dks/;ku
ea j[krsgq] ,Ls vfHkdYiukvkadsfy,, ijh{k.k.kkRed e,My
dksbI çdkj fn;k tk Idrk gS%tgkamipkj dsvuq i
voyksdu gS%

$$y_{ij} = \mu + \tau_i + \beta_j + \varepsilon_{ij}$$

tgka½

y_{ij} = jos¼¾1] 2] ....] b½ [k.M ea ios¼¾1] 2] .....] v½ mipkj
    ds vuq i voykdu g§

μ= I kekU; ek/; çHkko g§

τ_i= i ok mipkj çHkko g§

β_j= j ok [k.M çHkko g§

ε_{ij}= ;k–fPNd =fV ?kVd g§ tks iidN ¼0] σ^2½ dk vuq j.k
djrk g§ bl vky{k dsckn ds[kM e} 'kKn ÞykbLß ,oa
mipkj I eku : i I smi;kx fd, x, g§

I jpuk fof/k

bl vuq dkku i) fr dk fodkl o"kZ 2021&2022 eaHkkkkŒ—Œ
vŒi & Hkkjrh; —f"k l kfä; dh vuq dkku l aLFku] ubZfnYyh
dsijh{k.k vfHkdYiuk foHkkx eafd;k x;k FkkA

    mipkj I jpuk v¾s ¼s&1½ ds I kFk çkjHkkd ih<+ ds
çtuu ijh{k.k ds fy, vkfkkd : i I sçfr—fr ¼p–rep½
vfHkdYiuk dh ,d Jk[kyk uhpsfn, x, pj.kksadk mi;kx
djds çkIr dh tk I drh g%

çFke pj.k%v¾s^2 mipkjkaij fopkj dj}] tgka s≥5 vo;oka
ds I kFk ,d fo"ke vHkkT; ;k ¼4]2]....] s½ vo;oka dh
vHkkT; ?kkr g§A rc] çkjHkkd i£ä;kadk mi;kx djrsgq]
s×s vkdkj ds¼s&1½ oxZ I kjf.k;kadh I jpuk çkjHkd i£ä;kadk mi;kx djds fuEukuqlkj djk

i. çk–frd Øe eas vo;kadh igyh çkjHkd i£ä yA

ii. igyh çfof"V dksvifjofrr j[krsgq] fiNyh çkjHkd i£ä;kadscknd dh çR;sd vkusokyh çfof"V;kaeaØe'k% modsks ds I kFk 1]2]...] s&1 dh of) tkM+A

iii. bu çkjHkd i£ä;kadspØh; : i I s¼mods ½ds I kFk fodfl r djrkd çR;sd dsfy, s×s vkdkj dh ¼s-1½ oxZ I kjf.k;{ çkjHkd dh tk I dA

f}rh; pj.k%s^2 mipkjkadks s×s I kj.kh ea 0;ofLFkr dja vk§ bl spj.k 1 eafodfl r (s-1) I kjf.k;kaij vf/kjksfir dja

rrh; pj.k%I cÄ/kr s osLrEHk eaçfof"V;kds: i eafdl h fo'ks"k s osçrhd dsfy, I kekU; mipkj I£;kvkaij fopkj djdspj.k 2 eavkjksfir I kj.kh I s s×sØe dh ,d vk§ ¼s&1½ ubZ I kj.kh fodfl r djkA

prFkZ pj.k%pj.k 3 eaçkIr I kjf.k;kal s s^2 mipkjkads vfre s vo;oka okyh i£ä dksgVk nkA

ipe pj.k%vr e} pj.k 4 ea¼s&1½ I kjf.k;kal sØe'k% igyh] ubZ jh} --]¼s&1½ohai£ä dksgVkdj vk§ igyh$^{1/s-1}/_2$dks i;kbj.k 1 I} vk§ 'k½k i;kbj.k 2 I s tkM+dj ifj.kkeh

vkfk'kd : i I sçfr—fr vfHkdYiuk,açHkr djk I£;k lcf/kr
I jf.k;kadh I a[;k ekin/kkv¾s ¼s-1½ mipkjkadh I£;k
çR;d mipkj dks3 ckj çfr—r fd;k tkrk g§vFkkkr] r¾3]
e ≥ 2 i;kbj.k dh I£;k] [k.M vkdkj k¾s&2 okys b¾s
¼s&1½ [k.Mkadh I£;k dsI kFk ifj.kkeh vfHkdYiukvkadks
[k.M cukrh g§A

fp=.k%eku yhft, s¾45] v¾25 mipkjkadks tUe nrk g§A
s×s Øe dh pkj I kjf.k;kadh I jpuk pØh; : i I s4
çkjHkkd i£ä;ka¼1]2]3]4]5½ ¼1]3]5]2]4½ ¼1]4]2]5]3½ vk§ ¼1]5]4]3]2½
dks fodfl r djds bl çdkj dh xbZ g%

1	2	3	4	5		1	3	5	2	4		1	4	2	5	3		1	5	4	3	2
2	3	4	5	1		2	4	1	3	5		2	5	3	1	4		2	1	5	4	3
3	4	5	1	2		3	5	2	4	1		3	1	4	2	5		3	2	1	5	4
4	5	1	2	3		4	1	3	5	2		4	2	5	3	1		4	3	2	1	5
5	1	2	3	4		5	2	4	1	3		5	3	1	4	2		5	4	3	2	1

pkj I kjf.k;kadksfodfl r djusdksmijkar] 5×5 I kjf.k;ka
ea v¾25 mipkj dh 0;oLFkk uhpsfn, x, vuq kj djk

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

vc] fiNyh pkj I kjf.k;kaij 25 mipkjkadh 5×5 I kj.kh
dks I jibEikst djds t§k fd pj.k 3 eacrk;k x;k g§
vU; pkj ubZ I kjf.k;{ fodfl r djkbl suhpsfn;k x;k g§

1	2	3	4	5		1	4	2	5	3		1	3	5	2	4		1	5	4	3	2
10	6	7	8	9		8	6	9	7	10		9	6	8	10	7		7	6	10	9	8
14	15	11	12	13		15	13	11	14	12		12	14	11	13	15		13	12	11	15	14
18	19	20	16	17		17	20	18	16	19		20	17	19	16	18		19	18	17	16	20
22	23	24	25	21		24	22	25	23	21		23	25	22	24	21		25	24	23	22	21

çR;d I kj.kh I s vfire i£ä gVk,a vk§ i¿% I cÄ/kr pkj
I kj.kh I s igyh] ubZ jh} rhl jh vk§ pkSFkh i£ä;kadksgVk,
i£ä;kads[k.M ds: i eans[krsgq] igyh nksI kjf.k;ka
dks i;kbj.k 1 vk§ vU; nksI jf.k;kadks i;kbj.k 2 I s
I c) djrkd çkpy v¾20] e¾2] b¾20] r¾3 vk§ k¾3 ds
I kFk vkfk'kd : i I sçfr—fr ¼p–rep½ vfHkdYiuk uhps
fn[kk;svuq kj çkIr dh tk I d%

i;kbj.k&1										i;kbj.k&2									
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	2	3	4	5	1	4	2	5	3	1	3	5	2	4	1	5	4	6	10	9	8
10	6	7	8	9	8	6	9	7	10	12	14	11	13	15	13	12	11	15	14
14	15	11	12	13	17	20	18	16	19	20	17	19	16	18	19	18	17	16	20

mijkar vfHkdYiukvkadk vkSr fopkj vkS d&ukfudy
n{krk dkjd Øe'k% 1-2923 vkS 0-5158 g§A t§ &t§s
I{;kj{kk,ac<+rh g§A vfHkdYiukvkadh d&ukfudy n{krk

dkjd Hkh c<+rh gA mnkgj.k dsfy,] d&kfudy n{krk dkjd ¾20 ykbuka dsfy, 0-5152 vkj ¾42 ykbuka ds fy, 0-7943 gA

ifjppk

çkjafHkd ih<+h dsçtuu ijh{k.k es] fofHkUu okrkoj.kka esa cMh Lä[;k es¼ 1000½ çtuu ykbZuka ;k çfof"V;ka dk eV;kadu IekU;r% 4 vkj çR;d i;kbj.k es çfr—fr ds IkFk 2 Isde djus dh vko';drk gkrh gA Llk/kukvkj cht dh deh tSh Iæhek i;kbj.k vkj çR;d çtuu j{kk dsfy, HkKfEkVka dh Is;k de djus rh gA ,Ih fLFKfr;kae] vkf'kd : i Isçfr—fr vfHkdYiukvkae avPNh vuç;kx {kerk gksrh gAvkj bl dk ykHkkn mi;kx fd;k tk Idrk gA bl çdkj dh vfHkdYiukvka grq ,d Isjpuk çfØ;k fofy;El bR;kfn ½2011] 2014½ }kjk nh xbZ tks tfVy vkj le; yus okyh FkhA ;gka vkf'kd : i Isçfr—fr vfHkdYiuk dh Isjpuk grq ,d ubZ) fr çLrkfor dh xbZ gS tks mudh vuç;kx {kerk esvof) djrsgq] fofy;El bR;kfn ½2011] 2014½ }kjk nh xbZ i) fr dh rqyuk es vkIku gA

I UnHkZ

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