Hkkjrh; df"k vuqla/kku if=dk] 36(2): 81-84 DOI: 10.18805/BKAP266

feJ.k ç;kxksa d fy, lpjVM vfHkdYiukvksa dk fuekZ.k

jkgy cuthZ] lhek tXxh] ,Ynks oxhl[1] vi.kk Hkkfed] vfufUnrk nÙkk] fluh oxhl

Hkk-—vu-i&Hkkjrh; —f"k lkf[;dh vuqla/kku lLFkku] ykbcjh ,oU;] ilk&110 012] ub fnYyh] HkkjrA

ikIrk Qjojh 2021 Lohdrk tu 2021

lkjk'k

feJ.k ç;kx okLrfod thou d ç;kxksa e cgr vke gA feJ.k ç;kxksa d fy, vfHkdYiuksa fodflr djr oDr feJ.k ?kVdksa d vuqikr dk p;u bl rjg l fd;k tkrk g fd xf.krh; e,My dk i;kIr :i l fQV fd;k tk ld ,o ekinMksa dk vuqeku yxk;k tk ldA —f"k ç;kxksa e] feJ.k ?kVd ykx buiV d db lkr gk ldr g vFkok buiV dk Qly d vyx vyx of) pj.kksa e bl dnj foHkkftr fd;k tk ldrk g fd Qly ij ykx buiV dh dy ek=k fLFkj gA feJ.k ç;kxksa d fy, d'ky vfHkdYiuksa mi;kxh gkr g tc çfrfØ;k feJ.k e ektn vo;ok d lki{k vuqikr ij fuHkj gkrh gA lkfgR; e db ,Yxkfjne ,o áfjfLVDl miyC/k g] yfdu feJ.k ç;kxksa d fy, ,Yxkfjne d mi;kx e dkQh lhfer dke miyC/k gA ,Yxkfjnfed —f"Vdk.k dk mi;kx djd vyx&vyx vuqikr d fy, ,d fof'k"V e,My d fy, NkVh jUl e feJ.k ç;kxksa d fy, vfHkdYiuksa fodflr dju dh vko';drk gA bl v/;;u e geu feJ.k ç;kxksa e lpjVM vfHkdYiuksa d fuekZ.k d fy, ,Yxkfjne fodflr fd;k gA ,Yxkfjfed —f"Vdk.k ikjifjd —f"Vdk.k dh ryuk e db fcnqvksa t l fd fQV fd, tkus oky e,My(ju vkfn d lnHk e vfHkdYiuksa fuekZ.k e vf/kd cgrj ,o lxe lkfcr gkrk gA ; vfHkdiuksa okLrfod thou ç;kxksa e cgr vPNh rjg l vudy gA feJ.k ç;kxksa d fy, vfHkdYiukvksa d fuekZ.k e ,Yxkfjne dk mi;kx u doy dEl;V'kuy ykxr dk de djrk g] cfYd ,d fujrj vfHkdYiuksa fxM e vfHkdYiuksa dh vf/kd d'ky [kkt Hkh djrk gA

'kCn dthZ ,Yxkfjne —f"Vdk.k] feJ.k vfHkdYiuk] feJ.k ç;kx] lpjVM vfHkdYiukA

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Construction of Saturated Designs for Mixture Experiments

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ABSTRACT

Mixture experiments are very common in real life experiments. Designing a mixture experiment involves selection of the proportion of the mixture components in a fashion such that a mathematical model can be fitted adequately and the parameters could be estimated. In agricultural experiments, the mixture components may be several sources of the input applied or input may be applied at different crop growth stages in splits such that total quantity applied to the crop is constant. Efficient designs for mixture experiments are useful when the response is assumed to depend on the relative proportions of the ingredients present in the mixture. A number of algorithms and heuristics are available in

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[1]Hkkk—vu-i&dUæh; leæh ekfRL;dh vuqla/kku lLFkku] dkPph&682 018] djy] HkkjrA

literature; however, a limited work has been done in the use of algorithms for mixture experiments. There is a need to develop designs for mixture experiments in smaller number of runs for a specific model for varying proportions using algorithmic approach. In this study we have developed algorithms to construct saturated designs fort mixture experiments. The algorithm provides a greater flexibility in design construction in comparison to the traditional approach in terms of models to be fitted; number of runs to be requited *etc*. These designs are very well suited in real life experiments. The use of algorithms in construction of designs for mixture experiments not only reduces the computational cost but also results in a more efficient search of the design in a continuous design space.

Key words: Algorithmic approach, Mixture designs, Mixture experiment, Saturated designs.

çLrkouk

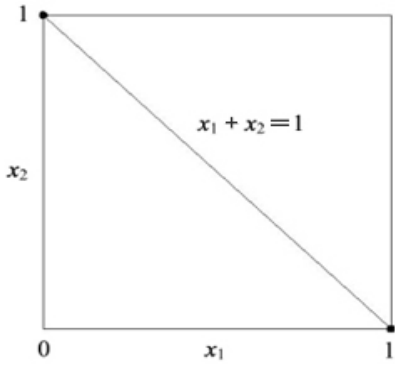
feJ.k ç;kx vke rkj ij vk|kfxd mRikn l=hdj.k e ik, tkr g] mnkgj.kkFkZ [kk| çlLdj.k] jklk;fud l=hdj.k] oL= m|kx] vk"k/kh; l=hdj.k bR;kfn] yfdu —f"k vul/kku d db {k=k e feJ.k ç;kxk dk bLreky lhfer gA vk|kfxd vul/kku d leku] —f"k vulU/kku e Hkh feJ.k ç;kx db {k=k e bLreky dju e mi;ä g] mnkgj.kkFkZ mojdk ;k dhVuk'kdk d fofHkUu feJ.kk dk ,d Qly d inkokj e çHkko —f"k vulU/kku e db fLFkfr;k ekt n gk ldrh g tgk ,d lex feJ.k çfrfØ;k ikjifjd 0;fäxr çfrfØ;kvk dh ryuk e vf/kd mi;kxh g tl fd] ekukdYpj cuke eYVhdYpj [krh] cht feJ.k] enk feJ.k] [kk| feJ.k dk tkuojk e çHkko bR;kfn] bu lkjh ifjfLFkfr;k e feJ.k fo'y"k.k rduhdk dk 0;kogkfjd egRo gk ldrk gA

,d feJ.k ç;kx e] Lor= dkjd ,d feJ.k d fofHkUu ?kVdk d vuikr gkr gA mnkgj.k d fy,] ;fn vki LVuyl LVhy dh rU;rk rkdr dk vudfyr djuk pkgr g] rk C;kt d dkjd feJ /kkr e ykgk] rkck] fudy vkj Økfe;e d vuikr gk ldr gA feJ.k ç;kxk e] çfrfØ;k flQ feJ.k e vo;ok ;k ?kVdk d lki{k vuikr ij fuHkj djrh g vkj feJ.k dh ek=k ij ugh] feJ.k dh ek=k dk ç;kx e ,d vfrjä dkjd d :i e Hkh v/;;u fd;k tk ldrk g] ;g rF; fd fofHkUu dkjdk d vuikr e 100% ;kx gkuk pkfg,] vfHkdYiuk d lkFk&lkFk feJ.k ç;kxk d fo'y"k.k dk tfVy cukrk gA

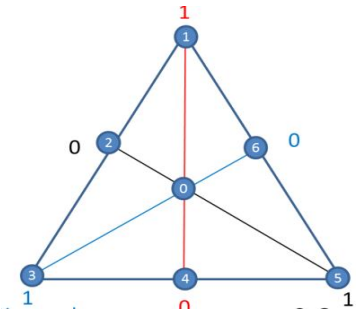
feJ.k ç;kxk dh fo'k"krk bl rF; l gkrh g fd çfrfØ;k y çR;d ?kVd Xi dk lki{k vuikr ij fuHkj djrh gA eku yhft, fd feJ.k e q ?kVd g] çR;d ?kVd 'kU; l ,d d chp eku y ldrk gA

$$\mathbf{x} = (x_1, x_2, \ldots, x_q) : x_i \geq 0, i = 1(1)q; \sum_{i=1}^{q} x_i = 1$$

; ck/kk, ,d ¼q-1½ vk;keh flEiyDl ¼Sq-1½ dk ifjHkkf"kr djrh gA mnkgj.k d fy,] ;fn feJ.k e nk ?kVd g rk flEiyDl ,d lh/kh j[kk ¼vk—fr 1½ cu tkrh gA ;fn feJ.k e rhu ?kVd g rk fllyDl ,d leckg f=Hkt ¼vk—fr 2½ cu tkrk gA



vk—fr 1¼ nk ?kVdh; feJ.k ç;kx ¼$x_1 + x_2 = 1$½A



vk—fr 1¼ nk ?kVdh; feJ.k ç;kx ¼$x_1 + x_2 + x_3$½A

lkfgR; e db feJ.k vfHkdYiuk; ektn g ftue lcl vke g%

- flEiyDl yfVl vfHkdYiukA
- flEiyDl lVjkbM vfHkdYiukA
- ,fDl;y vfHkdYiukA
- ,DlVhe oVDl vfHkdYiukA

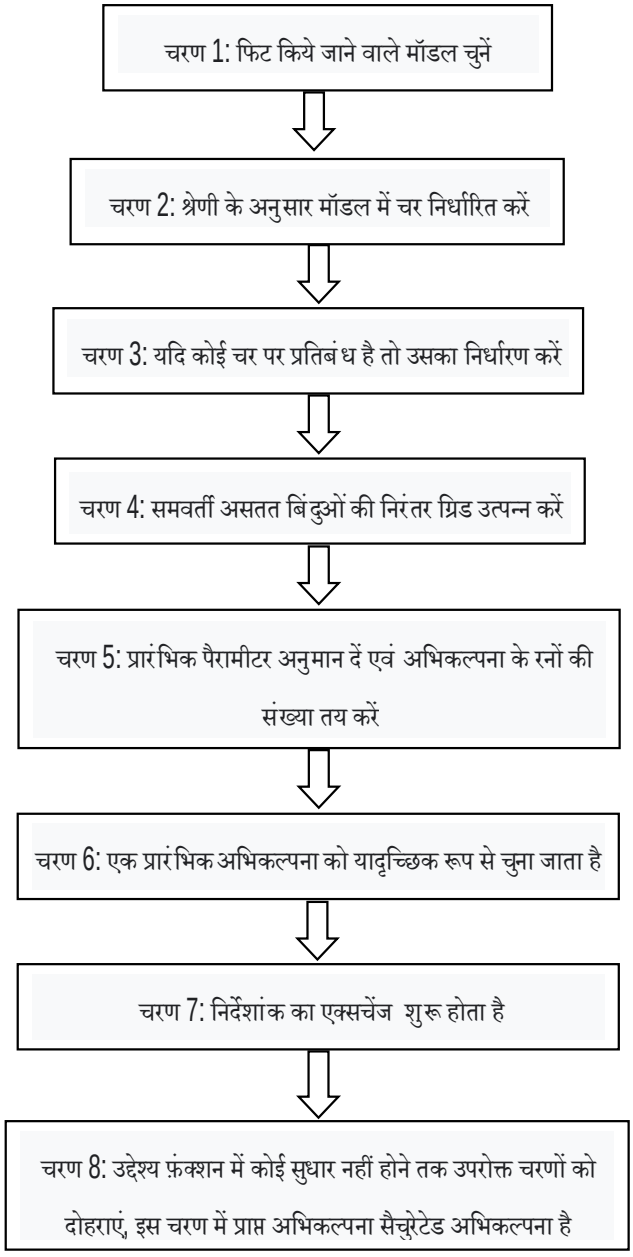
'kQ ¼1958½ u fllyDl yfVl vfHkdYiukvk d lkFk mi;kx fd, tku oky dukfudy i,yhvkfu;El dk i'k fd;kA ; cgin çfrc/k $\Sigma x_i = 1$ dk mi;kx djd x_i e lkekU; cgin e,My dk l'kkf/kr djd çkIr fd, tkr gA xj j[kh; e,My dk mi;kx dju dk ykHk ;g g fd] xj&j[kh; ?kVuk dk çn"ku dju okyh fLFkfr;k d ekey e] xj j[kh; e,My jf[kd e,My dh ryuk e fj'r dk cgrj <x l le>k,xA xj j[kh; e,My e jf[kd e,My dh ryuk e leku feJ.k / çfØ;k dh leL;k dk vueku yxku d fy, de ijkehVj gkr gA feJ.k ç;kxk e vfHkdYiuk fuek.k e ,YxkfjfFed –f"Vdk.k fuEufyf[kr fcnvk e ektnk rduhd l tknk dkjxj lkfcr gk ldrk gA

- vfHkdYiuk d fy, juk dh l[;k puu eA
- feJ.k ç;kxk e lkexh d fy, vuikr dk p;u dju eA
- fofHkUu e,Myk dh fQfVx d vulkj vfHkdYiuk fuek.k eA
- vfHkdYiuk ekunMk dk ijk dju d fy, vfHkdYiukvk d fuek.k eA

lkfgR; e igy l MVeDl ,YxkfjFke ¼fe'ky 1974½] d ,y &,Dlpt ,YxkfjFke ¼,Vfdlu ,o nkuo 1989½] XVERT ,YxkfjFe ¼L¥h ,o ekjDokMV 1974½ ,o XVERT1-0 ,YxkfjFke ¼fuxe 1979½ 'kkfey g] yfdu] ,Yxkfjnfed –f"Vdk.k dk mi;kx djd vyx&vyx vuikr d fy, ,o ,d fof'k"V e,My d vulkj NkVh l[;k e feJ.k ç;kxk d fy, vfHkdYiuk fodflr dju dh vko';drk gA bl fLFkfr d eíutj geu bl v/;;u e geu ,d ,YxkfjFe fodflr dju dh dkf'k'k dh g ftll ge de l de ju e feJ.k ç;kxk d fy, NkVh vfHkdYiuk; fodflr dj ldA

i)fr

,d lpjVM vfHkdYiuk dk vFk g fd e,My e vuekfur ijkehVj dh l[;k d cjkcj vfHkdYiuk dk ju gkrk gA fodflr ,YxkfjFe dk o.ku ljy ¶yko pkV e dN bl çdkj gA



vxj ge nk feJ.k vo;ok ,o rhu ekinMk d lkFk ,d feJ.k ç;kxkRed fLFkfr eku y] ftl fuEufyf[kr e,My }kjk n'kk;k tk ldrk g%

$$\eta = \beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2; 0 \leq (x_1, x_2) \leq 1;\ x_1 + x_2 = 1$$

bl ç;kxkRed fLFkfr e Åij mfYyf[kr ,YxkfjFe d tfj; ge fofHkUu bUØheV lkbt d fy, ,d rhu ju okyh lpjVM vfHkdYiuk fodflr dj ldr g tk dh bl çdkj g%

bUØheV lkbt	dfMMV lV dk vkdkj	çkIr lpjVM vfHkdYiuk	
0-01	101	x_1	x_2
		0-5	0-5
		0-0	1-0
		1-0	0-0
0-02	51	x_1	x_2
		0-5	0-5
		1-0	0-0
		0-0	1-0
0-03	34	x_1	x_2
		0-49	0-51
		1-0	0-0
		0-0	1-0
0-04	26	x_1	x_2
		0-52	0-48
		1-0	0-0
		0-0	1-0
0-05	21	x_1	x_2
		0-5	0-5
		1-0	0-0
		0-0	1-0
0-06	17	x_1	x_2
		0-5	0-5
		1-0	0-0
		0-0	1-0
0-10	11	x_1	x_2
		0-5	0-5
		1-0	0-0
		0-0	1-0

fu"d"k

bl v/;;u e ,d l'kkf/kr ,Yxkfjfe dk çLrkfor fd;k x;k g tk dh feJ.k ç;kxk e jf[kd ,o xj j[kh; e,My k d fy, lpjVM vfHkdYiukvk dk fuek.k dju e l{ke gA ; vfHkdYiuk; okLrfod thou ç;kxk d fy, cgr vudy gA çLrkfor ,Yxkfjfe dk vuç;kx dEI;V'kuy ykxr dk de dju vkj fujrj fMtkbu LFkku e [kk t d ç;kl e enn djrk gA

lnHk

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