Selection of Bayesian Multiple Deferred State Sampling Plan Based on Beta Prior Distribution

M. Latha[#1] and R. Arivazhagan[#2]

#1 Principal, Government Arts and Science College, Thiruvadanai- 623401, Tamil Nadu, India, e-mail : drmlatha14@gmail.com

#2 Research Scholar, Department of Statistics, Government Arts College, Udumalpet-642126, Tamil Nadu, India, e-mail : raarivan8313@gmail.com

***Abstract*:** This paper is concerned with the set of tables for the selection of Bayesian Multiple Deferred State Sampling Plan (BMDS-1(0,2)) plan on the basis of different combinations of entry parameters. Beta distributions is considered as prior distribution. Comparison is made with conventional Multiple Deferred State Sampling Plan.

***Key words*:** Bayesian MDS-1(c_1,c_2), Beta Binomial Distribution , Acceptance Quality Level (AQL), Limiting Quality Level (LQL), Producer's Risks (α), Consumer's Risks (β), Indifference Quality Level (IQL), Probabilistic Quality Region (PQR),Indifference Quality Region (IQL).

Corresponding Author : Arivazhagan .R

1. Introduction

Bayesian acceptance sampling approach is associated with the utilization of prior process history for the selection of distribution (viz., gamma Poisson , beta binomial) to describe the random fluctuations involved in acceptance sampling, Bayesian sampling plan requires the user to specify explicitly the distribution of defective from lot to lot. the prior distribution is the expected distribution of a lot quality on which the sampling plan is going to operate. The distribution is called prior, because it is formulated prior to the taking of samples. The combination of prior knowledge, represented with the prior distribution and the empirical knowledge based on the sample leads to the decision on the lot.

This paper introduces a method for selection of Bayesian MDS sampling plan based on range of quality instead of point wish description of quality by Invoking a Novel approach called quality interval sampling (QIS) plan. This method seems to be versatile and can be adopted in the elementary production process where the stipulated quality level is advisable to fix at later stage and provides a new concept for selection of BMDS-1(0,2) plan involving quality levels.

History of Bayesian sampling plan have derived in Dodge [3] has derived Chain Sampling inspection Plans. Case and Keats [2] have examined the relationship between defectives in the sample and defectives in the remaining lot for each of the five prior

distributions, they observe that the use of a binomial prior renders sampling useless and inappropriate. These results serve to make the designers and users of Bayesian sampling plans more aware of the consequence associated with selection of particular prior distribution. Calvin [1] has presented in a clear and concise treatment by means of 'how and when to perform Bayesian acceptance sampling'. These procedure are suited to the sampling of lots from process or assembly operations, which contain assignable causes. These causes may be unknown and awaiting isolation, known but irremovable due to the state of the art limitations, or known but uneconomical to remove. He has considered the Bayesian sampling in which primary concern is with the process average function non conforming p_1 with lot fraction non-conforming p and its limitations being discussed.

Hald [4] has derived optimal solutions for the cost function k(n,c) in the cases where the prior distribution is rectangular , polya and binomial. Tables are given for optimum n,c and k(n,c) for various values of the parameters, which is an important result on Bayesian acceptance sampling (BAS). Hald [5] has given a rather system of single sampling attribute plans obtained by minimizing average cost, under the assumptions that the cost linear in the fraction defective p. and that the depends on six parameters namely $N,P_r,p_1,p_2$and W_2 cost parameters and p_1,p_2,W_2, are however, that the weight combine with the pis such a way that only five independent parameters are left out.Wortham and Baker [16] have given Multiple Deferred State Sampling Plan inspection. Soundararajan [8] procedures and tables for construction and selection of Chain Sampling Plans (ChSP-1).Varest [15] A Procedure of Construct Multiple Deferred State Sampling Plans. Raju [7] Contribution to the study of Chain Sampling Plans. Soundararajan and Vijayaraghavan [9] have designing Multiple deferred state sampling (MDS-1(0,2)) plans involving minimum risks. Subramani and Govindaraju [10] have Selection of Multiple Deferred State MDS-1 Sampling Plan for given Acceptable and Limiting Quality Levels involving Minimum Risks. Suresh and Ramkumar [11] have Selection of a Sampling Plan indexed with a Maximum Allowable Average Outgoing Quality. Suresh and Latha [12] have discussed Bayesian Single Sampling Plan for a gamma prior distribution. Suresh and Latha [13] discussed the Construction and Evaluation of Performance Measures of Bayesian Chain Sampling Plan using Gamma Distribution as the prior distribution. Latha and Jayabharathi [6] have studied the selection of Bayesian Chain Sampling attributes Plan based on geometric distribution. Suresh and Sangeetha [14] have studied the selection of Repetitive Deferred Sampling Plan with Quality Regions. This paper designs the parameters of the plan indexed with AQL, LQL and α, β and IQL, PQR and IQR for specified s and i the parameter of the prior distribution with numerical illustrations are also provided.

2 MDS - 1 (c_1,c_2) Plan

Vaerst,Rembert [15] has developed MDS-1(c_1,c_2) (Multiple Deferred State) Sampling Plans in which the acceptance or rejection of a lot is based in not only on the results from the current lot but also on sample results of the past or future lots.

Condition for Application of MDS-1(c_1,c_2)

1. Interest centers on an individual quality characteristic that involves destructive or costly tests such that normally only a small number of tests per lot can be justified.
2. The product to be inspected comprises a series of successive lots or batches (or material or of individual units) produced by an essentially continuing process.
3. Under normal conditions the lots are expected to be essentially of the same quality.
4. The product comes from a source in which the consumer has confidence.

Operating Procedure of MDS-1(c_1,c_2)

Step 1: For each lot, Select a Sample of n units and test each unit for conformance to the specified requirements.
Step 2: Accept the lot if d (the observed number of defectives) is less than or equal to c_1; reject the lot if d is greater than c_2.
Step 3: If $c_1 < d \leq c_2$, accept the lot provided in each of the samples taken from the preceding or succeeding i lots, the number of defectives found is less than or equal to c_1; Otherwise reject the lot.

The OC function of MDS-1(c_1,c_2) is given by,

$$P_a(p) = P_a(p,n,c_1) + [P_a(p,n,c_2) - P_a(p,n,c_1)][P_a(p,n,c_1]^i$$

Vaerst, Rembert [15] has presented certain tables giving minimum MDS-1(c_1,c_2) plans indexed by AQL and LQL and observes the following properties.

1. MDS-1(c_1,c_2) Plans are natural extension of ChSP-1 Plans of Dodge (1955).
2. MDS-1 (c_1,c_2) plans allows significant reduction in sample size as compared to single sampling plans.
3. The use of acceptance number c_2 increases the chances of acceptance in the region of principal interest. Where the product percent defective is very low.
4. When i= 0, the plan becomes a single sampling plan with sample size n, and acceptance number c_2.
5. When i= ∞, the plan becomes a single sampling plan with sample size n, and acceptance number c_1.

Bayesian Average Probability of Acceptance

The Binomial Model of the OC curve of MDS-1 (0, 2) plan is given by

$$\mathrm{Pa(p)} = (1-p)^n + (1-p)^{n-2}[np(1-p) + \frac{n(n-1)}{2}p^2](1-p)^{ni} \quad (1)$$

The past history its observe that the process average p the beta prior distribution. The parameter s and t with density function,

$$f(p) = \beta(\mathrm{s,t,p}) = \frac{\mathrm{p}^{s-1}(1-\mathrm{p})^{t-1}}{\beta(\mathrm{s,t})}, \qquad 0 < p < 1,\ \ s,t > 0, \quad q = 1-p \quad (2)$$

With parameters s ,t and mean, μ= $\frac{s}{s+t}$

Under the proposed APA, the Probability of Acceptance of Multiple Deferred State Sampling Plan of type MDS-1(0,2) plan based on the Beta Binomial Distribution is given by,

$$\bar{P} = \int_0^1 P_a(p) f(p) dp \quad (3)$$

$$= \int_0^1 [(1-p)^n + np(1-p)^{ni+n-1} + \frac{n(n-1)}{2}p^2(1-p)^{ni+n-2}]\frac{\mathrm{p}^{s-1}(1-\mathrm{p})^{t-1}}{\beta(\mathrm{s,t})}dp$$

$$\bar{P} = \frac{1}{\beta(s,t)} \left[\beta(s,\ n+t) + n\beta(s+1,\ in+n+t-1) + \frac{n(n-1)}{2}\beta(s+2,\ in+n+t-2)\right] \quad (4)$$

The above equation is mixed distribution of Beta and Binomial distribution.

Construction of Table

If s=1, $\bar{P}$ is reduced and p_0 is the point of control, the above equation (4) can be reduced to

$$\bar{P} = \frac{(1-p)}{(np+1-p)} + \frac{np(1-p)}{(inp+np+1-p)(inp+np+1-2p)} + \frac{np^2(n-1)(1-p)}{(inp+np+1-p)(inp+np+1-2p)(inp+np+1-3p)} \quad (5)$$

Where $\mu = \frac{s}{s+t}$

If s=2, $\bar{P}$ is reduced to,

$$\bar{p} = \frac{(2-p)(2-p)}{(np+2-p)(np+2-2p)} + \frac{2np(2-p)(2-2p)}{(inp+np+2-p)(inp+np+2-2p)(inp+np+2-3p)} + \frac{3p^2n(n-1)(2-p)(2-2p)}{(inp+np+2-p)(inp+np+2-2p)(inp+np+2-3p)(inp+np+2-4p)} \quad (6)$$

If s=3, $\bar{P}$ is reduced to ,

$$\bar{p} = \frac{(3-p)(3-2p)(3-3p)}{(np+3-p)(np+3-2p)(np+3-3p)} + \frac{3np(3-p)(3-2p)(3-3p)}{(inp+np+3-p)(inp+np+3-2p)(inp+np+3-3p)(inp+np+3-4p)} + \frac{6p^2n(n-1)(3-p)(3-2p)(3-3p)}{(inp+np+3-p)(inp+np+3-2p)(inp+np+3-3p)(inp+np+3-4p)(inp+np+3-5p)} \quad (7)$$

Designing Plans for given AQL, LQL, α and β

Tables 1and 2 are used to design Bayesian Multiple Deferred State Chain Sampling Plan for given AQL, LQL, α and β. The steps utilized for selecting Bayesian Multiple Deferred State Sampling Plan (BMDS-1(0,2)) are as follows:

1. To design a plan for given (AQL, 1-α) and (LQL, β) first calculate the operating ratio μ_2/μ_1

2. Find the value in Table 2 under the column for the appropriate α and β, which is closest to the desired ratio.

3. Corresponding to the located value of μ_2/μ_1 the value of s, i can be obtained.

The Indifference Quality Level (IQL) or point of control ⍰$_0$ can be calculated by equating the above equations to 0.50 for various values of s, n using Newton's method approximation.

Example 1. For s=1, i=10, n=100, and $\bar{P} = 0.50$ the corresponding IQL value $\mu_0 = 0.01019$

For s=1, i=4, n=100, and $\bar{P} = 0.95$ the average product quality μ_1=0.00110

For s=2, i=4, n=100, and $\bar{P} = 0.10$ the average product quality μ_2=0.04286

From Table 1for the given variation Average Probability of Acceptance of the above equations. From the above example, we can understand that when s and i are increased, the average product quality is decreased.

Example 2. Suppose the value for μ_1 is assumed as 0.00095 and value for μ_2 is assumed as 0.085 then the operating ratio is calculate as 89.5. Now the integer approximately equal to this calculated operating ratio and their corresponding parametric values are observed from the table 2. The actual μ_1=0.00094 and μ_2=0.08467 at (α=0.05 and β=0.10).

4 Designing of quality interval Bayesian MDS Sampling Plan (BMDS-1(0, 2) plan)

Probabilistic Quality Region (PQR)

It is an interval of quality ($\mu_1 < \mu < \mu_2$) in which product is accepted with a minimum probability 0.10 and maximum probability 0.95

Probability Quality Range denoted as $d_2 = (\mu_2 - \mu_1)$ is derived from the average Probability of acceptance

$$\bar{P}(\mu_1 < \mu < \mu_2) = \frac{1}{\beta(s,t)}\left[\beta(s, n+t) + n\beta(s+1, in+n+t-1) + \frac{n(n-1)}{2}\beta(s+2, in+n+t-2)\right]$$

Where $\mu = \frac{s}{s+t}$, is the expectation of beta distribution and approximately the mean values of product quality.

Indifference Quality Region (IQR)

It is an interval of quality ($\mu_1 < \mu < \mu_0$) in which product is accepted with a minimum probability 0.50 and maximum probability 0.95

Indifference Quality Range denoted as $d_0 = (\mu_0 - \mu_1)$ is derived from the average Probability of acceptance

$$\bar{P}(\mu_1 < \mu < \mu_0) = \frac{1}{\beta(s,t)}\left[\beta(s, n+t) + n\beta(s+1, in+n+t-1) + \frac{n(n-1)}{2}\beta(s+2, in+n+t-2)\right]$$

Where $\mu = \frac{s}{s+t}$, is the expectation of beta distribution and approximately the mean values of product quality.

Selection of the Sampling Plan

Table 3, gives unique values of T for different values of 's' and 'i'. Here Operating Ratio

$T = \frac{□_2 - □_1}{□_0 - □_1} = \frac{d_2}{d_0}$, Where $d_2 = (□_2 - □_1)$ and $d_0 = (□_0 - □_1)$ is used to characterize the sampling plan. For any given values of PQR(d_2) and IQR(d_0) one can find the ratio $T = \frac{d_2}{d_0}$, Find the value in the Table 3, under the column T, which is equal to or just less than the specified ratio, corresponding 's' and 'i' values are noted. From this ratio one can determine the parameters for the BMDS-1(0,2) Plan.

Example 3. Given s=1, i=6 and μ_1= 0.00094 compute the values of PQR and IQR then compute T. Select the respective values from Table 3. The nearest values of PQR and IQR corresponding to s=1, i=6, and μ_1=0.00094 are d_2= 0.08373 and d_0= 0.00964, Then T= 8.68568. Hence the required plan has parameters n=100, s= 1, i=6, through Quality Interval.

In the similar way, the above equations are equated to the average probability of acceptance 0.95 and 0.10, AQL(μ_1) and IQL(μ_2) are obtained in Table 3.

Conclusion

Bayesian Acceptance Sampling is the best technique, which deals with the procedure in which decision to accept or reject lots or process based on their examination of past history or knowledge of samples. This paper deals with Bayesian Multiple Deferred State Sampling Plan based on beta prior distribution. However, all of them are either settled on a non-economic basis or do not take into consideration the producer's and consumer's quality and risk requirements. Using the Bayesian sampling attribute plan without a cost function for a prior distribution can reduce the sample size, while if producer's risk and consumer's risk are appropriate. The work presented in this paper mainly related to procedure for designing Bayesian multiple deferred state sampling plan for acceptable, risk and limiting , indifference for quality levels and quality regions. The quality level and quality interval sampling plan possesses wider potential applicable in industry ensuring higher standard of quality attainment for product or process. Thus quality interval and quality level are good measure for defining and designing for acceptance sampling plan which are readymade use to industrial shop-floor situations.

Table 1. Certain μ values for specified values of P(μ)

		Probability of Acceptance						
s	*i*	0.99	0.95	0.90	0.50	0.10	0.05	0.01
1	1	0.00078	0.00200	0.00319	0.01630	0.11280	0.20941	0.57742
	2	0.00056	0.00147	0.00238	0.01299	0.09515	0.18034	0.53245
	3	0.00046	0.00123	0.00203	0.01175	0.08938	0.17080	0.51656
	4	0.00041	0.00110	0.00183	0.01115	0.08682	0.16657	0.50940
	5	0.00037	0.00101	0.00170	0.01080	0.08547	0.16437	0.50560
	6	0.00034	0.00094	0.00160	0.01058	0.08467	0.16306	0.50335
	7	0.00032	0.00089	0.00153	0.01043	0.08416	0.16223	0.50192
	8	0.00030	0.00085	0.00148	0.01033	0.08382	0.16167	0.50095
	9	0.00028	0.00082	0.00143	0.01025	0.08357	0.16128	0.50026
	10	0.00027	0.00079	0.00140	0.01019	0.08339	0.16099	0.49978
2	1	0.00088	0.00218	0.00337	0.01350	0.05420	0.08258	0.18923
	2	0.00063	0.00159	0.00249	0.01073	0.04604	0.07124	0.16749
	3	0.00052	0.00133	0.00210	0.00966	0.04530	0.06824	0.16213
	4	0.00045	0.00118	0.00188	0.00914	0.04286	0.06714	0.16027
	5	0.00041	0.00107	0.00174	0.00885	0.04246	0.06666	0.15947
	6	0.00038	0.00100	0.00163	0.00867	0.04225	0.06641	0.15908
	7	0.00035	0.00094	0.00155	0.00855	0.04213	0.06627	0.15886
	8	0.00033	0.00090	0.00149	0.00847	0.04205	0.06619	0.15873
	9	0.00031	0.00086	0.00144	0.00842	0.04200	0.06613	0.15865
	10	0.00030	0.00083	0.00140	0.00838	0.04197	0.06610	0.15859
3	1	0.00092	0.00226	0.00346	0.01279	0.04251	0.06005	0.11703
	2	0.00066	0.00164	0.00164	0.01008	0.03638	0.05243	0.10517
	3	0.00054	0.00137	0.00137	0.00905	0.03483	0.05068	0.10287
	4	0.00048	0.00121	0.00121	0.00855	0.03430	0.05013	0.10222
	5	0.00043	0.00110	0.00110	0.00827	0.03408	0.04993	0.10199
	6	0.00039	0.00102	0.00102	0.00810	0.03398	0.04984	0.10189
	7	0.00037	0.00096	0.00096	0.00800	0.03392	0.04979	0.10185
	8	0.00035	0.00092	0.00092	0.00793	0.03390	0.04976	0.10182
	9	0.00033	0.00088	0.00088	0.00789	0.03388	0.04974	0.10181
	10	0.00031	0.00084	0.00084	0.00786	0.03387	0.04972	0,10180

Table 2.Values of μ_2/μ_1 tabulated against s and i for given α and β for Bayesian Multiple Deferred State Sampling Plan

s	*i*	μ_2/μ_1 *for* $\alpha=0.05$ $\beta=0.10$	μ_2/μ_2*for* $\alpha=0.05$ $\beta=0.05$	μ_2/μ_1 *for* $\alpha=0.05$ $\beta=0.01$	μ_2/μ_1 *for* $\alpha=0.01$ $\beta=0.10$	μ_2/μ_1 *for* $\alpha=0.01$ $\beta=0.05$	μ_2/μ_1 *for* $\alpha=0.01$ $\beta=0.01$
1	1	56.40000	104.705	288.71000	144.61539	268.47436	740.28205
	2	64.72789	122.68027	362.21088	169.91071	322.03571	950.80357
	3	72.66667	138.86179	419.96748	194.30435	371.30435	1122.95652
	4	78.92727	151.42727	463.09091	211.75610	406.26829	1242.43902
	5	84.62376	162.74257	500.59406	231.00000	444.24324	1366.48649
	6	90.07447	173.46809	535.47872	249.02941	479.58824	1480.44118
	7	94.56180	182.28090	563.95506	263.00000	506.96875	1568.50000
	8	98.61177	190.20000	589.35294	279.40000	538.90000	1669.83333
	9	101.91463	196.68293	610.07317	298.46429	576.00000	1786.64286
	10	105.55696	203.78481	632.63291	308.85185	596.25926	1851.03704
2	1	24.86239	37.88073	86.80275	61.59091	93.84091	215.03409
	2	28.95598	44.80503	105.33962	73.07937	113.07937	265.85714
	3	34.06015	51.30827	121.90226	87.11539	131.23077	311.78846
	4	36.32203	56.89831	135.82203	95.24444	149.20000	356.15556
	5	39.68224	62.29907	149.03738	103.56098	162.58537	388.95122
	6	42.25000	66.41000	159.08000	111.18421	174.76316	418.63158
	7	44.81915	70.50000	169.00000	120.37143	189.34286	453.88571
	8	46.72222	73.54444	176.36667	127.42424	200.57576	481.00000
	9	48.83721	76.89535	184.47674	135.48387	213.32258	511.77419
	10	50.56627	79.63855	191.07229	139.90000	220.33333	528.63333
3	1	18.80974	26.57080	51.78319	46.20652	65.27174	127.20652
	2	22.18293	31.96951	64.12805	55.12121	79.43939	159.34849
	3	25.42336	36.99270	75.08759	64.50000	93.85185	190.50000
	4	28.34711	41.42975	84.47934	71.45833	104.43750	212.95833
	5	30.98182	45.39091	92.71818	79.25581	116.11628	237.18605
	6	33.31373	48.86275	99.89216	87.12821	127.79487	261.25641
	7	35.33333	51.86458	106.09375	91.67568	134.56757	275.27027
	8	36.84783	54.08696	110.67391	96.85714	142.17143	290.91429
	9	38.50000	56.52273	115.69318	102.66667	150.72727	308.51515
	10	40.32143	59.19048	121.19048	109.25807	160.38710	328.38710

Table 3. Values of PQR and IQR, μ_2/μ_1 for specified values of s and i.

s	*i*	μ_1	μ_0	μ_2	d_2	d_0	T	μ_2/μ_1
1	1	0.00200	0.01630	0.11280	0.11080	0.01430	7.74825	56.40000
	2	0.00147	0.01299	0.09515	0.09368	0.01152	8.13194	64.72789
	3	0.00123	0.01175	0.08938	0.08815	0.01052	8.37928	72.66667
	4	0.00110	0.01115	0.08682	0.08572	0.01005	8.52935	78.92727
	5	0.00101	0.01080	0.08547	0.08446	0.00979	8.62717	84.62376
	6	0.00094	0.01058	0.08467	0.08373	0.00964	8.68568	90.07447
	7	0.00089	0.01043	0.08416	0.08327	0.00954	8.72851	94.56180
	8	0.00085	0.01033	0.08382	0.08297	0.00948	8.75211	98.61177
	9	0.00082	0.01025	0.08357	0.08275	0.00943	8.77519	101.91463
	10	0.00079	0.01019	0.08339	0.08260	0.00940	8.78723	105.55696
2	1	0.00218	0.01350	0.05420	0.05202	0.01132	4.59541	24.86239
	2	0.00159	0.01073	0.04604	0.04445	0.00914	4.86324	28.95598
	3	0.00133	0.00966	0.04530	0.04397	0.00833	5.27851	34.06015
	4	0.00118	0.00914	0.04286	0.04168	0.00796	5.23618	36.32203
	5	0.00107	0.00885	0.04246	0.04139	0.00778	5.32005	39.68224
	6	0.00100	0.00867	0.04225	0.04125	0.00767	5.37810	42.25000
	7	0.00094	0.00855	0.04213	0.04119	0.00761	5.41261	44.81915
	8	0.00090	0.00847	0.04205	0.04115	0.00757	5.43593	46.72222
	9	0.00086	0.00842	0.04200	0.04114	0.00756	5.44180	48.83721
	10	0.00083	0.00838	0.04197	0.04114	0.00755	5.44901	50.56627
3	1	0.00226	0.01279	0.04251	0.04025	0.01053	3.82241	18.80974
	2	0.00164	0.01008	0.03638	0.03474	0.00844	4.11611	22.18293
	3	0.00137	0.00905	0.03483	0.03346	0.00768	4.35677	25.42336
	4	0.00121	0.00855	0.03430	0.03309	0.00734	4.50817	28.34711
	5	0.00110	0.00827	0.03408	0.03298	0.00717	4.59972	30.98182
	6	0.00102	0.00810	0.03398	0.03296	0.00708	4.65537	33.31373
	7	0.00096	0.00800	0.03392	0.03296	0.00704	4.68182	35.33333
	8	0.00092	0.00793	0.03390	0.03298	0.00701	4.70471	36.84783
	9	0.00088	0.00789	0.03388	0.03300	0.00701	4.70756	38.50000
	10	0.00084	0.00786	0.03387	0.03303	0.00702	4.70513	40.32143

Reference

[1]. Calvin, T.W.(1984). How and When to Perform Bayesian Acceptance Sampling, Vol.7, *American Society for Quality Control*, Milwaukee, Wisconsin, USA.

[2].Case, K.E and Keats, J.B.(1982). On the Selection of a Prior Distribution in Bayesian Acceptance Sampling, *journal of Quality Technology*, Vol.14, No 1, pp.10-18.

[3]. Dodge, H.J.(1955). Chain Sampling Inspection Plans, *Industrial Quality Control*, vol.11,No.4, pp.10-13.

[4]. Hald, A.(1960). The Compound Hypergeometric Distribution and a system of Single Sampling Inspection Plans based on Prior Distribution and Costs, *Technometrics*, Vol.2, pp.275-340.

[5]. Hald, A.(1965). Bayesian Single Sampling Plans for Discrete Prior Distribution, *Mat. Fys. Skr. Dan. Vid. Selsk.*, Vol.3, No.2, pp.88, Copenhagan, Munksgaard.

[6].Latha, M. and Jeyabharathi, S.(2012). Selection of Bayesian Chain Sampling Attributes Plans based on Geometric Distribution, *International Journal of Scientific and Research Publication*, Vol.2, issue 7.

[7]. Raju, C.(1984). Contribution to The Study of Chain Sampling Plans, Ph.D. Thesis, *Bharathiar University, Combatore,*Tamilnadu, India.

[8]. Soundararajan, V. (1978a). Procedure and Tables for Construction and Selection of Chain Sampling Plans (ChSP-1), Part 1, *Journal of Quality Technology*, Vol.10, No.2, pp.56-60.

[9]. Soundararajan, V and Vijayaraghavan, R. (1989). On designing Multiple Deferred State Sampling (MDS-1(0,2)) Plans involving Minimum Risks. *Journal of Applied Statistics*, vol 16,issue 1, pp.87-94.

[10]. Subramani, K and Govindaraju, K. (1990). Selection of Multiple Deferred State MDS-1 Sampling Plan for Given Acceptable and Limiting Quality Levels involving Minimum Risks, *Journal of Applied Statistics*, vol. 17, no. 3,pp.431-434.

[11]. Suesh, K.K and Ramkumar,T.B. (1996). Selection of a sampling plan indexed with a maximum allowable average outgoing quality, J*ournal of Applied Statistics*, vol. 23,pp. 645-654.

[12]. Suresh, K.K. and Latha, M.(2001). Bayesian Single Sampling Plans for a Gamma Prior, *Economic Quality Control*, Vol.16,No.1, pp.93-107.

[13]. Suresh, K.K. and Latha, M.(2002). Construction and Evaluation of Performance Measures for Bayesian Chain Sampling Plan (BChSP-1), *Far East Journal of Theoretical Statistics*, Vol.6, No.2, pp.129-139.

[14]. Suresh, k.k.and Sangeetha, V.(2010). Selection of Repetitive Deferred Sampling Plan Through Quality Region, *International Journal of Statistics and Systems*, Vol.5, No.3, pp.379-389.

[15]. Vaerst, Rambert,.(1981): A Procedure to Construct Multiple Deferred State Sampling Plan, *Method of Operation Research*, Vol.37, pp.477-485.

[16].Wortham, A.W. and Baker, R.C.(1976): Multiple Deferred State Sampling Inspection, *The International Journal of Production Research*, Vol.14, No.6, pp.719-739.