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'MURUM' FILTER HELPS IN REDUCING CROSS SECTION IN CONTOUR BUNDING

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An extent of hydraulic gradient line can be reduced considerably by providing *murum* filter at the base of the bund. This helps in reducing the recommended bund section by keeping the side slope the same as is presently advocated. The results indicated that the cross sections of the contour bunds with provision of *murum* filter can be reduced from 18.94 to 30.23 per cent according to the soil depth, over the presently recommended sections which ultimately helps in reducing the cost of construction of the bunds.

Soil and water are the two important natural resources which are required to be utilized properly for better crop production. However, soil erosion is a serious problem throughout the world. Maharashtra State was amongst the foremost in the country undertaking soil conservation measures on large scale from 1943 on catchment basis. A programme of contour bunding in shallow and medium deep soils in low rainfall area was adopted with an object to defend the soil against further erosion and consequent rainfall conservation which ultimately leads to more crop production.

The sections of the contour bunds depend upon the depth of the soil. While aligning the contour bunds the deviation of 15 cm on ridge and 30 cm in crossing a gully is allowed to avoid the zig-zag alignment (Gadkary, 1966). It is expected that a maximum of 60 cm water stagnate against the bund during heavy rains. The stagnated water exerts Hydraulic pressure which causes seepage through the bund. The hydraulic gradient line mus lie within the base of the bund to make the structure safe (Satpute, 1966). When it passes outside the base of the bund, the bund is likely to breach.

If we provide a partially disintegrated permeable material of rock locally called as *murum* at the base of the bund at the time of construction, the hydraulic gradient line will fall within the limit. With a view to study the effect of *murum* filter as drainage gallery an the extent of hydraulic gradient line, these studies were conducted in different bund sections and at different heights of water at the Dry Farming Research Station, Solapur from 1971-72 to 1975-76 in shallow and medium deep soils.

MATERIAL AND METHODS

The recommended section of 0.95 m^2, 1.20 m^2, 1.45 m^2 and 2.15 m^2 in medium deep soil and 0.95m^2, 1.05 m^2 1.20 m^2 and 1.45 m^2 in shallow soils were constructed. In one set of bunds, a *murum* filter (22.5 cm thick) was

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provided. at half of the base at down-stream side while the other set of the bund is kept as such without *murum* filter. The observations regarding the extent of seepage line were recorded at water stagnation heights of 30.0, 37.5, 45.0 and 52.5 cm with the help of pizometers. The hydraulic gradient is then worked out by the following formula as prescribed by Spangler (1951):

$$i = \frac{h}{d}$$ where, i is the hydraulic gradient,
h is the drop in head and
d is the distance in which the drop occurs.

RESULTS AND DISCUSSION

The observations recorded regarding hydraulic gradient and hydraulic gradient line are given in Table 1.

Table 1 Extent of seepage line and hydraulic gradients in different bund sections

Section of bund (m^2)	Base of bund (m)	Height of water stagation (cm)	Without murum		With murnm filter	
			Extent of seepage (cm)	Hydraulic gradient	Extent of seepage (cm)	Hydraulic gradient
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	SHALLOW SOIL					
0.95	200	30.0	184	0 163	120	0.250
		37.5	213	0.176	135	0.377
		45.0	222	0.203	150	0.300
		52 5	233	0.226	162	0.324
1.05	230	30.0	190	0.158	125	0.240
		37.5	195	0.192	141	0.262
		45 0	225	0.200	143	0.315
		52.5	230	0.228	167	0 314
1.20	250	30.0	107.5	0.279	97.5	0.307
		37.5	195	0 242	150	0.250
		45.0	187.5	0.239	180	0.250
		52.5	232.5	0.225	195	0.269
1.45	300	30.0	115	0.261	62.2	0 483
		37.5	167.5	0.223	137.5	0.272
		45 0	230.0	0.195	145·0	0.310
		52.5	283.5	0.185	187.5	0.280
	MEDIUM DEEP SOIL					
0.95	200	30.0	107	0.280	90	0.336
		37.5	156	0.241	115	0.327
		45.0	215	0.210	120	0·376
		52.5	275	0.191	153	0.343

(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.20	250	30.0	114	0.281	109	0.274
		37.5	160	0.234	123	0.303
		45.0	215	0.228	120	0.376
		52.5	230	0.228	132	0.398
1.45	300	30.0	125	0.243	118	0.256
		37.5	159	0.238	141	.270
		45.0	216	0.208	222	0.202
		5.25	275	0.192	236	0 222
2.15	420	30 0	158	0.192	131	0.227
		37.5	197	0.192	175	0.212
		45 0	314	0.212	275	0.163
		52.5	331	0.227	317	0 165

(A) *Shallow soils.*

Four sections of 0.95 m², 1.05 m², 1.20m² and 1.45m² were studied in shallow soils. In case of 0.95m² cross section, the extent of seepage line was found to be ranging from 184 cm to 233 cm at water stagnation heights of 30 to 52.5 cm without provision of *murum* filter. However with provision of *murum* filter as drainage gallery, the extent of seepage line was reduced to 120 to 162 cm at water stagnation heights of 30 to 52.5 cm. As regards the hydraulic gradient, the range was from 0.163 to 0.226 at the corresponding water stagnation heights. However, with provision of *murum* filter, the range was from 0.250 to 0.324 at the corresponding water heights. At the water stagnation heights of 52.5 cm, the extent of seepage line was 233 cm, which would pass outside the base of the bund and there was probability of breaching of the bund. However, with provision of *murum* filter, the extent of seepage line was only 162 cm, which was within the permissible limit of the base of the bund. Same trend of decrease in the extent of seepage line with provision of *murum* filter was observed for cross sections of 1.05m², 1.20m² and 1.45m² also.

(B) *Medium deep soils :*

In medium deep soils, four sections having cross sections of 0.95m², 1.20m², 1.45m² and 2.15m² were studied at water stagnation heights of 30, 37.5, 45 and 52.5 cm. In case of cross section of 0.95 m², it was observed that the seepage line at water stagnation heights of 52.5 cm, was 275 cm, which passes the base of the bund. Taking into consideration the maximum water stagnation heights of 60 cm against the bund, it is not advisable to construct the bund of 0.95 m² in medium deep soils. However, with provison of *murum* filter, the extent of seepage line and hydraulic gradients were found to be considerably reduced. Similar trend of decreased hydraulic gradient line with provision of *murum* filter was noticed in the cross sections of 1.20 m², 1.45 m², and 2.15 m² as shown in Fig. 1. In the bund having

cross section of 1.20 m², the seepage line was extended from 114 cm to 230 cm but with provision of *murum* filter, the extent of the same was decreased upto 109cm to 132cm at the corresponding water stagnation heights. In case of 1.45 m² cross section, where *murum* filter was not provided, the extent of seepage line varied from 125 cm to 275 cm. However, with provision of *murum*, the seepage line ranged from 118 cm to 236 cm at the same water stagnation heights. Further, in case of 2.15 m² cross section, the seepage line ranged from 158 cm to 331 cm, while with providing *murum* filter, the extent of seepage line decreased considerably.

In general, the observations recorded in both soil types having different bund sections, it was observed that the bunds constructed with provision of *murum* filter at the base, which acts as a drainage gallery, the extent of hydraulic gradient line was considerably reduced. This ultimately helps in bringing the hydraulic gradient line within the base of the bund and there is less possibility of breaching of bund due to hydraulic pressure. By taking advantage of the reduced seepage line, it would be possible to reduce the recommended bund sections by keeping the side slope same as that presently advocated. From the resultst the cross sections to be kept with provision of *murum* filter and the percentage reduction in cross sections are given in Table 2 and graphically shown in Fig. 1.

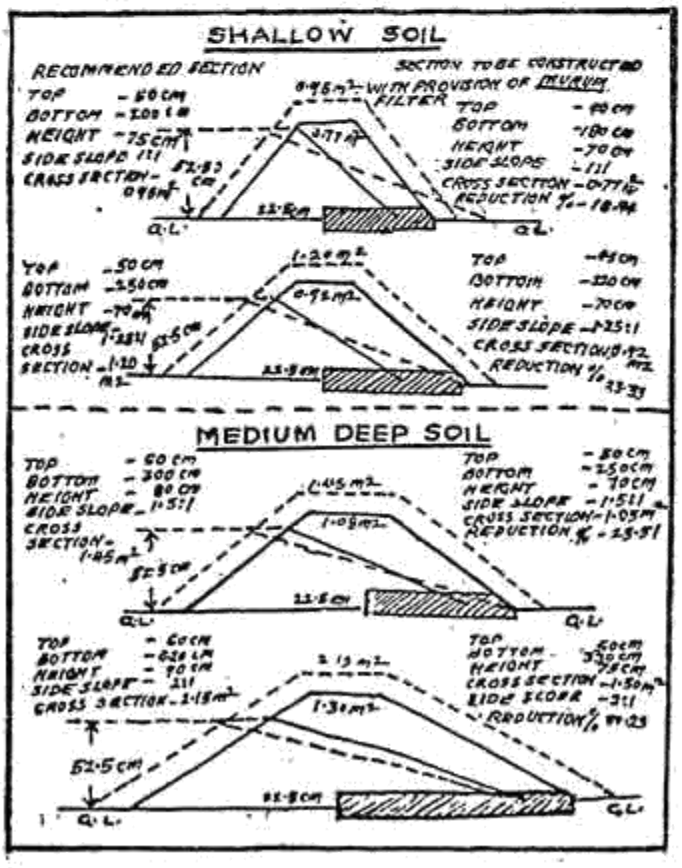

Table 2. Reduction in bund section with provision of *murum* filter.

Soil type	Soil depth (cm)	Presently recommended section (m^2)	Bund section to be kept with provision of *murum* filter (m^2)	Percentage reduction in cross section
Shallow soil	0-8	0.95	0.77	18 94
	8-25	1 20	0 92	23.33
Medium deep soil	25-50	1.45	1.08	25.51
	50-100	2.15	1.50	30.23

It will further be seen that, by provision of *murum* filter, there is possibility of reducing the presently recommended bund sections from 18.94 to 30.23 per cent depending upon the soil type. This will ultimately result in reducing the cost of construction of the bunds proportionately.

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A COMPARATIVE STUDY OF ASSESSING THE QUALITY OF UNDERGROUND IRRIGATION WATER OF BILAGI TALUKA, BIJAPUR DISTRICT OF KARNATAKA STATE BY USDA AND AYERS METHODS

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One hundred water samples from different wells were collected and analysed to assess for its quality both by USDA and Ayers methods. The majority waters studied were C_4S_1 (36%), C_3S_1 (34%) and C_1S_1 (21%), and they were of $Na\text{-}HCO_3$ type. Permeability of the soil may be affected due to high Na but not due to low salt concentration of the waters studied.

In Karnataka, the area irrigated by open wells amount to nearly 28 percent of the total irrigated area and the quality of such ground water is of particular importance in arid zone. Bijapur with less than 500 mm annual rainfall is one of the dry districts of Karnataka state where irrigation is mainly through

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