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Pakistan J. Agric. Res. Vol. 12 No. 4, 1991

ENVIRONMENTAL EFFECTS ON BACTERIAL COUNT FROM GRAPEVINE NURSERIES IN JORDAN

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ABSTRACT: A microbial survey of seven fields in three grapevine nurseries in Jordan during 1986 showed significant differences in the viable count of total bacteria and agrobacteria between the fields within the same nursery or between fields of different nurseries. The highest viable count for both parts of the survey was mostly in spring and the lowest was mostly either in summer or in autumn. Multiple regression of both parts of the survey at $P<0.05$ showed no significant regression between the viable count and the environmental condition such as temperature, pH, moisture organic matter, total nitrogen content, phosphorus, potassium and soil structure. Plant type, plant exudate, plant age and microbial interaction may have the effect on viable count fluctuations during the study period.

Key Words: Grapevines; Bacteria; Cell Count; Plant Diseases; Environmental Conditions; Jordan.

INTRODUCTION

Soil bacteria may be either inhabitants like agrobacterium or invaders like *Erwinia*. Genus *Agrobacterium* is a plant pathogen which can survive in soil for many years saprophytically (De Boer, 1982).

Three plant diseases, crown gall, cane gall, and hair root, all characterized by host cell proliferation, are caused by different species of the genus *Agrobacterium* (Lippincott and Lippincott, 1975). Soil surrounding galls is highly populated by the genus *Agrobacterium* (Ark and Schroth, 1958; Kerr, 1969 and New and Kerr, 1972). Number of agrobacteria around roots being thousand fold than the nearby soil (New and Kerr, 1972, and Schroth et al., 1965). Temperature above 34°C and acidic soil reduce the survival of agrobacteria, sandy soil may under some conditions favour their survival (Siegler, 1940). Non pathogenic agrobacteria are predominant in soil even in the vicinity of diseased plants (Kerr, 1969).

In this work the effects of environmental conditions on the total bacterial and agrobacterial counts were determined.

MATERIALS AND METHODS

Study Fields

Three grapevine nurseries were included in this study. They were divided into:

a) *Baqura Nursery:* 1. Grape cultivated (Bg), 2. Control non-cultivated (Bc).
b) *Rayyan Nursery:* 1. Grape cultivated (Rg), 2. Control non-cultivated (Rc).
c) *Deiralla Nursery:* 1. Grape cultivated and sterilized by methyl bromide just before cultivation (D_1), 2. Grape cultivation non-sterilized (D_2), 3. Control non-cultivated and non-sterilized (Dc).

Sampling and Treatment

During 1986 monthly soil samples consisted of a mixture of nine Agaur

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holdings collected from the top 20 cm (after removing the upper 2-3cm layer) from fixed region of the study fields. Soil mixture was dried at room temperature and sieved through 2mm x 2mm sieve. One gram sieved soil was suspended in 100 ml sterile distilled water and shaked at 190 rpm for 30 minutes. Serial dilutions (10^{-1}–10^{-6}) were made. 0.1 ml of the appropriate dilution was spread by sterile L-shaped glass rod on standard plate count agar medium (for total bacterial count) and on Kado and Heskett (1970) medium (for agrobacterial count). Cultures were incubated at 27°C for 2-3 days. From each sample three plates were inoculated and the average of their counts was taken as the mean monthly count. The mean count of three respective months represented the seasonal mean count (e.g. the mean count of March, April and May represent spring mean count).

Soil Analysis

After drying and sieving soil samples were analysed. pH was recorded using pH meter. Organic matter was determined by Walkley and Black method as described by Jackson (1958) and for nitrogen percentage Kjeldahl method was followed as reported by Bremner (1965). Phosphorus concentration was recorded following Jackson (1962). Potassium concentration was detected following Richards (1954). Soil texture and percentage of silt, sand and clay was recorded following Bonyoncos (1962).

RESULTS AND DISCUSSION

The highest viable count for total bacteria at Deiralla nursery was in spring in all the study fields (Table 1) whereas the lowest viable total bacterial count was in autumn for all the study fields. The highest viable count of agrobacterial at the same nursery was in autumn at D_1 and Dc fields and in winter at D_2 field, whereas the lowest viable agrobacterial count was in spring at D_1 and Dc fields and in autumn at D_2 field, this may be due to microbial interaction, plant exudate and climatic condition as reported by De Boer (1982) and Brown (1978).

Total viable bacterial and agrobacterial count in spring was the highest among Baqura and Rayyan nurseries (Table 1) the lowest total viable bacterial count was in summer at Bg, in autumn at Bc and Rc and in winter at Rg, whereas the lowest agrobacterial viable count was in summer at Bc and Rc in winter at Bg and in autumn at Rg. Gradual decrease in viable count especially in summer for agrobacteria may be due to high temperature (above 30°C), because the optimum temperature for agrobacteria is 27°C , as reported by New and Kerr (1971), Kado and Hescket (1970), Schroth et al. (1965). Decrease in count during autumn may be due to falling effect, plant exudate or plant age as reported by De Boer (1982).

There was slight or entirely no change in air humidity, organic matter, pH, phosphorus, nitrogen, potassium and soil structure (silt, sand and clay percentage) at all the study fields especially within the same nursery (Table 1).

Chi square (X^2) test showed a significant difference between the study fields in each nursery during seasonal changes for both total viable bacterial and agrobacterial counts. There was a noticeable difference between cultivated and non-cultivated fields within the same nursery.

Table 1. Viable count fluctuation of total bacteria and agrobacteria according to environmental variation of Deiralla, Baqura and Rayyan nursery in Jordan

Season	Study field	Total bacterial count $x10^7$	Agrobacterial count $x10^4$	Environmental variation								
				T°	Air humidity	Org. matter	pH	Total N(%)	P (ppm)	K (ppm)	Silt (%)	Clay (%)
Deiralla Nursery												
Spring	D_1	27.00	9.5	25.97	44.67	1.5	8.0	0.75	9.0	655	25.1	45.6
	D_2	104.30	72.5	25.97	44.67	1.5	8.1	0.75	12.0	655	34.5	45.4
	Dc	2.73	12.6	25.97	44.67	1.6	8.0	0.80	6.0	695	31.3	47.3
Summer	D_1	7.05	9.8	31.10	41.30	1.6	8.0	0.80	8.0	695	29.5	41.0
	D_2	1.00	49.7	31.10	44.30	1.4	7.8	0.70	9.0	695	29.6	46.6
	Dc	1.80	29.3	31.10	44.30	1.8	8.0	0.90	8.0	710	24.6	54.3
Autumn	D_1	2.10	47.2	21.80	44.67	1.5	7.9	0.75	13.0	670	25.6	49.0
	D_2	0.33	39.9	21.80	44.67	1.5	8.0	0.75	4.0	670	25.7	55.3
	Dc	0.40	39.3	21.80	44.67	2.0	7.9	1.00	7.0	740	29.0	54.7
Winter	D_1	2.50	39.0	16.30	51.30	1.5	8.0	0.75	6.0	640	33.2	40.6
	D_2	2.70	114.0	16.30	51.30	1.5	8.1	0.75	10.0	645	28.1	46.2
	Dc	1.30	38.0	16.30	51.30	1.5	8.0	0.75	9.0	722	27.6	52.3
Baqura Nursery												
Spring	Bg	1116.0	130.00	24.67	58.00	2.3	8.1	1.15	16.0	560	21.5	59.2
	Bc	5.2	57.90	24.67	58.00	2.0	7.1	1.00	16.0	640	18.8	55.3
Summer	Bg	0.91	33.60	29.93	59.00	2.0	8.0	1.00	6.0	560	20.4	58.7
	Bc	3.99	7.40	29.93	59.00	1.5	8.0	0.90	20.0	550	22.1	59.1
Autumn	Bg	1.08	34.80	20.73	62.33	2.1	8.0	1.05	20.0	495	23.0	55.7
	Bc	0.25	20.42	20.73	62.33	1.7	8.2	0.85	24.0	550	29.2	55.3
Winter	Bg	2.29	18.65	15.03	64.30	2.0	8.0	1.00	18.0	520	22.7	56.3
	Bc	1.80	59.50	15.03	64.30	2.0	8.0	1.0	20.0	560	22.3	56.7
Rayyan Nursery												
Spring	Rg	540.00	308.00	25.00	58.30	1.6	8.1	0.8	48.0	565	25.3	56.4
	Rc	844.00	107.00	25.00	58.30	1.1	8.1	0.55	4.0	565	29.3	58.2
Summer	Rg	23.00	150.00	30.30	62.00	1.7	8.2	0.85	50.0	735	28.6	58.6
	Rc	6.70	40.70	30.30	62.00	1.2	8.2	0.60	2.0	550	32.2	63.2
Autumn	Rg	2.30	33.20	19.80	68.00	1.6	8.1	0.80	50.0	735	27.2	61.4
	Rc	0.64	79.00	19.80	68.00	1.1	8.0	0.55	7.0	565	27.8	64.1
Winter	Rg	1.70	40.00	14.70	69.00	1.6	8.2	0.80	48.0	730	29.2	57.7
	Rc	1.47	52.00	14.70	69.00	1.1	8.2	0.55	5.0	565	31.2	59.3

Soil texture was clay in all the fields.

Multiple regression of both parts of the survey for the total bacteria and agrobacteria showed no significant regression at $P<0.05$ between the viable count and some environmental conditions such as temperature, humidity, phosphorus, potassium, nitrogen, organic matter, pH and soil structure. This indicates that the seasonal fluctuation in the viable count of both parts of the study may be due to soil treatment, plant type, plant exudate, soil moisture microbial interaction and soil invasion by microorganisms as reported by De Boer (1982).

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Pakistan J. Agric. Res. Vol. 12 No. 4, 1991

CHANGES IN LIVEWEIGHT OF BALUCHI EWES GRAZING ON CEREAL CROP RESIDUES

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ABSTRACT: A 60 days' feeding trial was conducted on 52 yearling Baluchi ewes grazed on cereal crop residues containing stubbles, stems, leaves and spikes. The ewes were randomly divided into four groups and were assigned to four feeding regimes viz., (i) only grazing on cereal crop residues (CCR) (ii) grazing alongwith supplementation of either barley grain (BG) (iii) cotton-seed-cake (CSC) and (iv) a mixture of BG+CSC. Data on voluntary intake of dry matter (DMI, g/day), metabolizable energy (MEI, MJ/day) crude protein (CPI, g/day) and liveweight gain (LWG, g/day) of ewes was subjected to statistical analysis using analysis of variance technique. The results indicated highly significant differences ($P < 0.01$) in the DMI and MEI whereas FCR and liveweight gain of ewes was found significantly different at $P < 0.05$. The DMI, MEI and CPI were the highest among ewes supplemented with BG. The economical analysis revealed that supplementation with CSC was most efficient to utilize CCR for ewes feeding, as cost per unit of liveweight gain was less as compared to other supplementary feeds of BG or BG + CSC.

Key Words: Ewes; Grazing Land; Cereal Crop Residue; Feed Supplementation; Liveweight; Crude Proteins; Oilseed Cakes; Barley Straw; Pakistan.

INTRODUCTION

Millions of tons of cereal crop residues (CCR) are produced every year around the agricultural farms, mainly from the production of wheat, barley and rice. As these crops are harvested at maturity, residues contain high percentages of cell-wall-contents compared to cell-contents. The cell-wall-contents mainly comprise ligno-cellulose. The association of lignin with cellulose alongwith phenolic monomers, not only depresses the extent of fibre digestion but also inhibits the microbial growth and enzymatic digestion in the rumen. It also interacts with nitrates, bile salts, amino acids and possible minerals in the gastro-intestinal tract, blocking the supply of dietary components of nutritional significance for animals as well as microbes in the rumen of animals (Jung and Fahey, 1983). As these residues contain low levels of cell-contents, they are poorly digested and lead to loss in liveweight of animals. Simple and inexpensive treatment processes which break the association of lignin with cellulose or supply of readily available energy and nitrogen supplements, could contribute significantly in the efficient utilization of these crop residues, hence increased livestock production (Pigden and Bender, 1972). Maximum use of these feed resources will help in bridging the gap between demand and supply of proteins of animal origin in the country (Ranjhan and Chadhokar, 1984).

The objective of this experiment was to determine the effect of energy and protein supplementation on the utilization of cereal crop residues and ultimately liveweight gain of ewes.

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