

found to influence nitrification in Activated Sludge,^{4,5} has also been studied.

Out of the eighty-one different strains of bacteria isolated on nutrient agar and other media from samples of water, soil, sewage, compost and faeces of animals (the bacteria characterised according to Bergey⁶), thirty-seven were found to produce nitrite (sixteen of these produced only traces of nitrite) in aqueous suspensions of soil, sewage and compost materials. The observations on the nitrite-forming bacteria and the amounts of nitrite produced by the different bacteria, singly and in combination, as also the influence of protozoa on nitrification are given in Tables I and II. The effect of addi-

tion of small amounts of Activated Sludge and septic tank sludge on nitrification in the medium was also studied.

Nitrification in aerated sewage and other media was found to start only after the flocculation of the suspended and colloidal matter in the media: formation of nitrite was found to proceed after aeration for 24 to 72 hours, largely depending upon the nature and concentration of the organic matter and the inoculum; and production of nitrate was found to take place as the aeration was prolonged after 72 to 96 hours.

The observations given in Tables I & II show that the nitrite-producing bacteria are common-

TABLE I

Extent of nitrite production by the individual strains of bacteria from different sources, with and without *Vorticella* sp. (after aeration of the medium for 96 hours)

Sources examined	No. of different strains of bacteria isolated	Media employed for the nitrification test (800 c.c.)	No. of nitrite-formers observed	Nitrite produced (p.p.m.)	Nitrite produced by bacteria in presence of <i>Vorticella</i> sp. (p.p.m.)
River water ..	2	Sterilised sewage	1	0.06	2.50
Tank water ..	6	"	5	traces to 0.08	0.2 to 3.0
Borewell water ..	3	"	2	traces to 0.08	0.25 to 1.50
Garden soil ..	6	Sterilised soil suspension	1	traces	0.35 to 0.60
Compost heaps ..	13	Sterilised compost extract	2	traces to 0.04	0.12 to 2.0
Raw sewage ..	3	Sterilised sewage	1	0.04	0.06 to 0.08
Septic tank sludge ..	2	"	1	0.04	0.08
Activated sludge ..	3	"	3	0.04	0.12 to 0.20
Cow dung ..	7	"	3	traces to 0.04	0.08 to 0.12
Horse dung ..	8	"	2	traces	0.25 to 3.0
Faeces of rat, rabbit, dog and monkey	28	"	16	traces to 0.06	0.07 to 3.80

1. c.c. of active bacterial culture was used as inoculum in each case; the protozoan inoculum contained about 20,000 active cells of *Vorticella* sp.

TABLE II

Effect of addition of mixed cultures of bacteria, protozoa, and sludges to suspension of soil, sewage and compost on nitrification in the medium (after 96 hours' aeration)

Treatments (in each case 2 litres of sterilised suspension of soil and compost extracts and sewage mixed in the proportion of 1:1:1)	Nitrite nitrogen (p.p.m.)	Nitrate nitrogen (p.p.m.)
Mixed cultures of all the 81 strains of bacteria	0.04	Nil
Washed cells of <i>Vorticella</i> sp. ..	0.40	traces
Washed cells of <i>Epistylis</i> sp. ..	1.80	0.80
Activated sludge ..	2.50	traces
Septic sludge ..	0.30	Nil

The percentages of nitrification by the bacteria associated with the protozoa and in the sludges were found comparatively negligible; the number of active protozoa in the protozoan inocula and in the activated sludge introduced was about 22,000 in each case; the septic sludge also contained a corresponding number of protozoa including *Vorticella* sp. but mostly in the form of cysts which on aeration became active.

ly distributed in nature and that the amounts of nitrite produced by the bacteria alone, singly or all together, are less than those formed in presence of certain forms of protozoa, such as the *Vorticellids* occurring in Activated Sludge.

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INFLUENCE OF HEAT ON THE PHYSICO-CHEMICAL PROPERTIES OF GUM-ARABIC

GUM-ARABIC, an acid polysaccharide, is mainly a calcium salt of arabic acid,¹ the nucleus of which is aldobionic acid (galactose-glucuronic acid) to which sugar molecules of galactose, arabinose and methyl pentose are attached.

Gum-arabic (composition:—Pentosan 34.34 per cent.; Galactan 33.93 per cent.; moisture 15.53 per cent.; Ca 0.6459 per cent) when heated to 170° C., and then introduced into water swells up to a considerable extent, but does not dissolve; and the gel thus formed is non-sticky. There is practically no change in the chemical composition of the gum on heating it from 100°-170° C. The insolubility of the gum at 170° C., can be explained to be due to complete dehydration. On dehydration some of the molecular groups approach so closely² that when they are again brought in contact with water, their attraction for water molecules or its ions is unable to separate them.

The viscosity of the gum solutions goes on increasing (the relative viscosity of 6 per cent. solutions of the gums heated to 100° and 150° C., being 3.780 and 5.898 respectively) as the gum is heated from 100°-150° C. The increase in viscosity is due to the increase in the imbibed water. Water appears to be oriented in a shell surrounding the gum micelles and thus the disperse phase becomes, highly solvated which results in the increase of viscosity. This view is further confirmed from the results of dilatometric experiments—in which the volume contraction is found to increase with the temperature to which the gum has been heated.

Action of NaOH on the gum heated to different temperatures was studied potentiometrically. The quantity of NaOH required for reaching the neutral point goes on increasing with the rise of temperature. The quantities of 0.02N NaOH required to neutralise the acidity of 2 gms. of heated gum to 110° C. and 170° C. are 4.55 and 14.3 c.c. respectively. The phenomenon is explained on the basis of difference between the ionisation of calcium and sodium arabates, and due to the different hydration of calcium and sodium ions as found by David R. Briggs.³

The full paper on the subject will be published elsewhere.

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EFFECT OF NITROGENOUS FERTILIZERS ON THE RESPIRATION RATE OF POTATO TUBERS

OVERHOLSER and Claypool¹ and Harding,² working with strawberry and apple respectively, recorded a higher respiratory activity in fruits from plants, manured with nitrogenous fertilizers as compared to the control. The author has studied the effect of nitrogenous fertilizers on the respiratory activity of potato tubers of the variety, Darjeeling Red, grown at the Agricultural College Farm, Benares Hindu University, during 1943-44 and fertilized with ammonium sulphate at 40 and 80 lbs. N per acre,

applied before planting. Tubers of almost equal size from control and manured plots were collected and their respiratory activity studied. For determining the respiration rate of tubers, the usual method of drawing CO₂ through Pettenkofer tubes containing baryta water was followed. The quantity of CO₂ absorbed by baryta water was estimated by titrating against standard HCl and the indices of respiration were computed by reducing the values to the unit fresh weight of the experimental material. The effect of nitrogenous fertilizers on the respiration rate of the potato tubers is given below.

TABLE I
Carbon dioxide evolved (mg./gm. of tubers)
per hour at 30° C. in tubers

Days after planting	Control	Manured Plot	
		40 lb. N. per acre	80 lb. N. per acre
		Mean values	
64	0.134	0.207	0.327
78	0.122	0.252	0.327
92	0.164	0.245	0.314
103	0.160	0.214	0.262

It will be noted that the tubers obtained from the manured plots showed a higher rate of respiration at all the stages of tuber development. Sircar³ also found that potato discs on absorption of ammonium nitrate showed an increased respiration rate.

It is generally believed that the material with a higher respiration rate has a poor keeping quality, and this was confirmed when the greater losses during storage were recorded with the tubers from the manured plots of this experiment.⁴

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SETT ROOTS IN SUGARCANE

SUGARCANE is vegetatively propagated by planting setts. At every node above the leaf-joint there is a region of root-initials (keimring). When setts are planted in the field, roots develop from these root-initials, and these are termed "sett roots", in contrast to the roots that develop from the sprouted bud at the same node and which are called "shoot-roots". Barber¹ and Venkataraman *et al.*² emphasized the importance of sett roots for the full development of the bud into a shoot. That the sett roots function only temporarily in the early stages and that the shoot-roots replace them have also been pointed out by the same authors.