



Coden: PSIRAA 30(12)877-952 (1987)

PAKISTAN JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Vol. 30, No. 12, December 1987

Physical Sciences. Pages 877 – 904

Biological Sciences. Pages 905 – 937

Technology. Pages 938 – 952

Published monthly by

PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
KARACHI

Physical Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 30, No. 12, December 1987

ETHANOL AS A SUBSTRATE FOR SINGLE CELL PROTEIN PRODUCTION

Growth Studies of Ethanol-Utilizing Yeast Strain *Candida utilis* EUY-G2*

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(Received November 17, 1986; revised September 29, 1987)

Candida utilis EUY-G2 was cultivated in batch culture on ethanol as a sole source of carbon. The optimum growth of this yeast strain was observed at 30 to 33° and at pH 5.0. Trace amounts of Fe^{++} , Mg^{++} and Ca^{++} ions were required. Diammonium hydrogen phosphate was the most effective nitrogen source. The growth rate was dependent on the concentration of ethanol, reaching a maximum at 1.0 % (w/v). The maximum specific growth rate and cell yields were 0.46 hr^{-1} and 75 % (w/v) respectively. The biomass contained 53.4 % crude protein, 0.7 % crude fat and 8.1 % nucleic acid. The amino acid profile, except for methionine, compared well with FAO reference levels.

Key words: Ethanol, Protein, *Candida utilis*.

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STUDIES ON THE PHYSIO-CHEMICAL CHARACTERISTICS OF A NEW GENOTYPE OF AUTUMN (ZAID KHARIF RAYA)

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(Received April 9, 1987; revised December 15, 1987)

Studies were conducted to determine the physio-chemical characteristics of RD-80, a new *Brassica juncea* cultivar. RD-80 flowered and matured 15-20 days earlier than both parents, viz, Poorbi raya and Raya N.S. The variety was shorter in height (131 cm) than Poorbi Raya (141 cm) and Raya N.S (143 cm). Three-year results showed that the number of pods/plant (832), mean 1000 seed weight (2.85 g) and seed yield (2251.75 kg/ha) were also higher than those of the parents i.e. Poorbi raya (2090.24 kg/ha) and Raya N.S. (1893.05). The oil yield, physio-chemical composition and fatty acid composition is comparable with both parents.

Key words: *Brassica juncea*, yield (kg/ha), RD-80, raya N.S. Poorbi raya, fatty acid composition.

MICROBIAL SYNTHESIS OF XANTHAN GUM BY REPEATED-BATCH PROCESS

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(Received July 16, 1984; revised December 15, 1987)

Production of xanthan gum by a locally isolated culture of *Xanthomonas cucurbitae* PCSIR – 52 in sugar cane juice and synthetic sucrose-salt media was studied by submerged fermentation in 1-litre conical flasks and by repeated batch process in a 10 l stirred fermenter. The rate of gum synthesis and the percentage conversion of sugar to biopolymer were greater in the fermenter than in the shake flasks. The efficiency of the culture remained about the same in three cycles of 50 hr. each during repeated batch process. Xanthan gum formation was higher in synthetic sucrose-salt medium (20.0 g/l) than in sugar cane juice (14.0 g/l). The addition of cotton seed meal as “proflo extract” enhanced the rate of gum synthesis.

Key words: Xanthan gum; *Xanthomonas cucurbitae*; Fermentation of sucrose salt.

CHEMICAL PROFILING OF GROUND WATER OF AL-KHARJ, SAUDI ARABIA

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(Received August 12, 1986; revised December 8, 1987)

Groundwater quality of Al-Kharj, Kingdom of Saudi Arabia, was studied through the analysis of 115 samples for EC, pH, TDS, Ca, Mg, Na, K, B, CO_3 , Cl, NO_3 , PO_4 and SO_4 . Correlation of electrical conductivity (EC at 25°mmhos/cm) with total dissolved solids (TDS) for the area was found to be $Y=823X-63$ ($N=115$; $R=0.968$) as compared to the overall formula of the Kingdom, $Y=850X-200$ and that of the US Salinity Laboratory's formula $Y=640X$. Correlation of EC with ions like sodium, chloride and sulphate were studied; this shows that sulphate is the most dominant ion in this area ($R=0.793$).

Frequency distribution of cumulative parameters like TDS showed 80% of sample population in the range of 1000 to 2000 mg/l and above, while pH values ranged from 6.5 to 7.5 for 84% of the population.

Key words: Ground water, Chemical analysis, Correlation of EC.

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CHEMICAL AND BACTERIOLOGICAL STUDIES ON WATER OF VARIOUS SOURCES IN THE BENGHAZI AREA*

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(Received July 10, 1987; revised December 10, 1987)

Samples collected from different water sources were analysed for their major and minor chemical constituents. The values thus obtained were compared with their sources of collection. The major constituents in all the samples were found to be sodium, chloride, sulphate and bicarbonates. Large variations in the levels of the major constituents were encountered among the water samples collected from lake, wells and tap. Lake water contained lowest amounts while high quantity of major chemicals was found in the tap water of the Benghazi area. The levels of alkalinity, hardness, calcium, magnesium and potassium were comparatively less altered. Attempts were made to correlate the present findings with possible biological hazards. Bacteriological studies provide no indication for the presence of any pathogenic micro-organisms in water.

Key words: Environmental pollution, Water analysis, Benghazi water.

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STUDIES ON THE PHYSICO-CHEMICAL ASPECTS OF AZIZ BHATTI LAKES

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(Received December 11, 1986; revised November 26, 1987)

This paper deals with the study of physico-chemical conditions of the Aziz Bhatti lakes. These are two artificial lakes which were constructed in 1970. During the course of this study the peaks of water temperature were always found coinciding with the atmospheric temperature. No marked variations were observed in the pH and colour of water. Generally the high values of nutrients were observed throughout the year and it may be due to the decomposition of aquatic weeds because both of these lakes have large quantities of aquatic weeds and they are almost in senescent stage.

Key words: Nutrients, Aquatic weeds.

Biological Sciences Section

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ISOLATION AND CHARACTERIZATION OF SOME ACIDOPHILIC THIOBACILLI FROM SEWAGE WATERS

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(Received May 20, 1987; revised November 1, 1987)

By appropriate enrichment, two acidophilic chemolithotrophic bacterial strains resembling *Thiobacillus thiooxidans* and *T. ferrooxidans* have been isolated from sewage waters. These strains possess characteristics which make them suitable in bacterial solubilization of sulphide as well as carbonate bearing ores by sulphur or ferrous iron amendments. Growth behaviour of these strains on sulphur, ferrous iron and thiosulphate is reported.

Key words: Isolation, Thiobacilli, Acidophilic.

Pakistan J. Sci. Ind. Res., Vol. 30, No. 12, December 1987

COMPARISON OF METHODS AND RATES OF NITROGEN APPLICATION IN WHEAT

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(Received April 15, 1987; revised October 26, 1987)

The efficiency of two nitrogen sources, urea and slow-release, sulfur-coated urea (SCU), was evaluated using different rates and application methods during 1976-77 on Chenab-70 wheat on a clay loam soil at the University of Agriculture, Faisalabad. A randomized complete block design, with 12-m² plots and four replications was used. The highest rate, 112 kg N ha⁻¹ increased plant height and fertile tillers per unit area, more than other treatments. In general, banding gave greater yield than broadcasting or broadcasting and incorporating nitrogen regardless of source or rate of application. Urea nitrogen was used more efficiently than slow-release SCU.

Key words: Wheat, Urea, Sulfur-coated urea, Banding, Broadcasting, Broadcasting and Incorporating

YIELD AND QUALITY OF AUTUMN PLANTED SUGARCANE AS AFFECTED BY GEOMETRY OF PLANTING AND INTERCROPPING

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(Received February 22, 1987; revised November 3, 1987)

Some newly designed patterns of planting sugarcane facilitating intercropping were tested in a replicated field trial, using wheat and berseem as intercrops. The planting patterns comprised 90, 120 and 150 cm apart double, triple and quadruple row strips, respectively with 30 cm space between the rows of each strip. The results revealed that all the three planting systems appeared to be equally good with regards to germination, cane thickness and sucrose contents in cane but differed significantly from one another in respect of cane length, number of harvestable cane/unit area and final cane yield/ha. Sugarcane planted in 3-row strips 120 cm apart gave the highest cane yield of 93.67 tonnes/ha as against 88.49 and 85.95 tonnes/ha for 2-row and 4-row strip planting systems, respectively. Sugarcane intercropped with berseem gave significantly lower cane yield/ha than that intercropped with wheat or non-intercropped sugarcane. The reduction in cane yield/ha as a result of berseem and wheat intercropping amounted to 16.38 and 2.94 percent, respectively. However, at the cost of this reduction, an additional harvest of 68.54 to 71.09 tonnes/ha of berseem green fodder and 2.25 to 2.43 tonnes of wheat grain $\pm$ 3.64 tonnes of wheat bhoosa/ha was obtained which compensated more than the loss in cane production.

Key words: Sugarcane, Intercropping, Planting geometry.

THE POSSIBLE ROLE OF ALLELOPATHY EXHIBITED BY ROOT EXTRACTS AND EXUDATES OF CHINESE CABBAGE IN HYDROPONICS

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(Received February 17, 1985; revised November 29, 1987)

Aqueous extracts from fresh and dried roots and root exudates of the Chinese cabbage collected on filter papers and in glass vials, besides reducing its own radicle growth, fresh and dry mass, also inhibited the growth of mustard (*Brassica campestris*) in various experiments. Extracts from dried roots were more inhibitory than those from fresh root. Mustard was more susceptible than the Chinese cabbage. The inhibitory effects of root exudates or extracts suggested that allelopathy might play a significant role in reducing productivity in hydroponics.

Key words: Roots, Allelopathy, Hydroponics.

RESIDUAL BEHAVIOR OF THE INSECTICIDE PERMETHRIN IN TOMATOES, SOIL AND DIFFERENT pH EMULSIONS

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(Received September 29, 1986; revised June 28, 1987)

Tomato plants grown in the field and greenhouse were sprayed with 0.2 % Kavil (10 % EC permethrin) and residue analysis was performed in fruits and soil at 0, 1, 2, 5, 7, 9 and 13 days post treatment. Permethrin residues were also monitored in aqueous buffers of pH 5, 6, 7 and 8.

The data showed that permethrin persisted longer in soil and tomatoes grown under greenhouse conditions than in the field. Permethrin was more stable in low pH emulsions.

Key words: Tomatoes, soil, pH buffers, persistence, permethrin, insecticide.

Pakistan J. Sci. Ind. Res., Vol. 30, No. 12, December 1987

FIELD EVALUATION OF DIFFERENT WEEDICIDES AGAINST WEEDS OF WHEAT CROP

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(Received October 21, 1986; revised November 22, 1987)

Field investigations were carried out to study cultural and herbicidal effects on weed control in wheat crop under irrigated conditions. The results showed that Chlortoluron, Isoproturon, Methabenzthiazuron, Bromoxynil + MCPA and Metaxuron (post-emergence herbicides) significantly decreased the weed population of *Chenopodium album*, *Melilotus alba*, *Anagallis arvensis*, *Cronopus didymus* and *Phalaris minor*. Benzoylpropyl ethyl was least effective in controlling *Melilotus alba* and *Phalaris minor*. The weed plots yielded 16% more than the weed control plots. This compares with yield increase of 35% from Methabenzthiazuron and 21% from Isoproturon.

Key words: Wheat, Weed control, Herbicides, Weeding losses, Economic return, Pakistan.

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NITROGEN RETENTION BY ADULT HUMANS ON MAIZE BREAD SUPPLEMENTED WITH PEANUT, CHICKPEA AND PEANUT-CHICKPEA FLOURS

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(Received November 2, 1985; revised December 3, 1987)

The nitrogen balance of six adult human subjects fed on maize bread alone and supplemented with 20 % each of peanut flour, chickpea flour and peanut-chickpea flour (1 : 1) was studied. The diets were isonitrogenous (10 g N/day) and isocaloric (2900 kcal/day). Maize bread in each diet provided 70 % of the protein intake and the rest was derived from other fruits and vegetable sources (20 %) and milk (10 %). The results showed that the average nitrogen balance of subjects fed unsupplemented maize bread (+ 0.13 g/day) was significantly ($P < 0.05$) improved with all the supplemented breads (plus 0.34 – 0.39 g/day). It was concluded that fortification of maize bread with the above mentioned protein sources can enhance the nutritive quality of maize bread for adult human subjects.

Key words: Nitrogen balance, *Zea mays* L., Protein content of maize bread.

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EUPHAUSIIDS OF SOMALIAN WATERS AND GULF OF ADEN COLLECTED IN S. W. MONSOON SEASON

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(Received August 18, 1987; revised December 6, 1987)

Fifteen species of Euphausiacea belonging to 5 genera were reported from the coastal waters of Somalia and Gulf of Aden. Ten species were found in the Gulf of Aden and eleven were collected off Somali coast. Five species were common in the Gulf and Western Indian Ocean (0° – 10° N) while 4 of these species were also reported from Red Sea. Bathypelagic species of the genus *Thysanopoda* were present off Somali waters and absent in the Gulf of Aden samples. Sex ratio and abundance are also discussed.

Key words: Euphausiacea, Indian ocean, Gulf of Aden.

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Key words: Euphausiacea, Indian ocean, Gulf of Aden.

Technology Section

Pakistan J. Sci. Ind. Res., Vol. 30, No. 12, December 1987

AN ENZYMIC METHOD FOR DETERMINATION OF ADDED WATER IN MILK

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(Received December 23, 1986; revised December 28, 1987)

Tryptic digestion of milk proteins in various adulterated samples from buffalow was carried out for 60 minutes, free amino acids and smaller peptides thus released were separated from undigested proteins by precipitation with trichloro acetic acid (TCA) followed by centrifugation. The decrease in absorbance of supernatants at 280 nm of different water adulterated samples was found to be correlated with degree of dilution. Thus a simplified method of determining the percentage of added water in milk is suggested which does not involve the use of any specific dye or highly sophisticated equipments. The results are reproducible and comparable to the extent of adulteration obtained by Cryoscope, a highly reliable instrument. Thus the technique may be adopted as common routine method in dairy industries with simple procedure based on determinations of fat and specific gravity of milk.

Key words: Enzyme, adulteration, milk.

CALCIUM GLUCONATE FERMENTATION OF MAIZE GUR (HYDROL) IN STIRRED 50 L. FERMENTER

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(Received October 24, 1985; revised November 26, 1987)

Various raw products such as maize gur and liquid glucose were tried as substrate for the production of calcium gluconate by *Aspergillus niger* WRL 51. The effect of temperature, different concentrations of substrates and rate of aeration was also investigated.

The maximum conversion of glucose present in the substrates into calcium gluconate was achieved at 16-24 hr. after inoculation. Optimum temperature and the rate of aeration was $30 \pm 2^{\circ}$ and 500 cc/l/m respectively. The production of calcium gluconate was higher in medium containing maize gur than that of liquid glucose i.e. 132 g/l and 118 g/l respectively.

Key words: Maize gur (hydrol), Calcium gluconate, Liquid and commercial glucose.

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STUDIES ON THE PREPARATION OF PROTEIN ENRICHED SOFT DRINK FROM MUSTARD SEED CAKE

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(Received August 19, 1987; revised December 29, 1987)

A protein enriched soft drink, containing various levels of mustard seed protein, was prepared. Protein dispersibility of the heat processed beverage was found to be maximum at pH 6.8. Fat fortification also helped in stabilizing the beverage. Addition of 0.6 % carboxy methyl cellulose resulted in maximum protein dispersibility in the beverage.

Key words: Mustard seeds, protein isolate, soft drink.

Pakistan J. Sci. Ind. Res., Vol. 30, No. 12, December 1987

MEASUREMENT OF SIEVE TRAY EFFICIENCY

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(Received July 8, 1986; revised November 19, 1987)

Murphree tray efficiency (E_{ML}) and mass transfer coefficient ($k_L a$) have been measured, using a 61 x 30.5 cm sieve tray with large perforation diameter i.e. 9.5 mm for an absorption system using CO_2 -air and water system. Dependence of E_{ML} and $k_L a$ on the flow rates have been demonstrated.

The relationship between E_{ML} , N_{OL} , $k_L a$, $\bar{\tau}$ and δ^2 has also been examined.

Key words: Sieve tray efficiency.