Physical Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

STUDIES OF TRIPLET NAPHTHALENE QUENCHING BY PEROXIDE

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(Received May 6, 1970)

The measured value of first-order decay constant of triplet naphthalene in solution as reported by different workers differs widely. Causes of variations have been attributed to varying amounts of impurity present in the solvent. This investigation was undertaken to determine whether the second-order quenching processes are due to the presence of peroxide. The values obtained for k_0 are lower than the diffusion-controlled rate constants, showing that for peroxide the quenching rates at room temperature are reaction-controlled and so could not account for the impurity quenching of naphthalene in solutions. Detailed measurements on t-butyl hydroperoxide revealed that naphthalene acts as a photosensitizer for the decomposition of peroxide.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, 1971

SOLVENT–SOLUTE INTERACTIONS IN DIMETHYL SULFOXIDE REVEALED BY VAN'T HOFF FACTOR

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(Received June 8, 1970; revised September 1, 1970)

Van't Hoff factors for sixteen organic acids in DMSO have been determined using a simpile cryoscopic method. The data indicate that oxalic acid, trichloroacetic acid and picric acid are completely onized in DMSO while dichloroacetic acid is only 50% ionized. Other acids that show 10% ionization or less are salicylic, phenylacetic, tartaric, succinic, maleic, fumeric, monochloroacetic and phthodic acids. Benzoic, malonic and glutaric acids show almost no ionization.

Attempt has been made to sort out solvent–solute interactions by correlating the van't Hoff factor data in DMSO with similar data available for aqueous solutions.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

COMPARATIVE STUDIES OF PROTON MAGNETIC RESONANCE OF SOME SUBSTITUTED SKATYL MANNICH BASES AND RELATED COMPOUNDS. PART V

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(Received January 22, 1971)

The study of the PMR spectra of *N*-skatylpyrrolidine (I), *N*-skatylpiperidine (II), *N*-skatylisatin (III), *N,N*-diskatylpiperazine (IV), *N*-skatyl-α-naphthylamine (V), skatyl (phenanthroyl-2)-methane (VI), β-morpholinethyl-2-phenanthroyl ketone hydrochloride (VII), and 1-indolylbutan-3-one (VIII) have been described.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

COMPARATIVE STUDIES OF MASS SPECTRA OF SOME DISUBSTITUTED PYRROLES AND PIPERAZINE DERIVATIVES. PART VI

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(Received January 22, 1971)

The comparative studies of mass spectra of α,α′-di-(3-keto-5-phenylpent— Δ4-enyl)pyrrole (I), α,α′-di-(3-keto-5-phenylpentyl) pyrrole (II), α,α′-di-(2-benzoylethyl) pyrrole (III), *N,N*-diskatyl piperazine (IV) and *N,N*-di(β-benzoylethyl) piperazine (V) have been described. The mass spectral fragmentation pattern of the above compounds showed regular and similae losses.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

SYNTHESIS OF HETEROBICYCLIC COMPOUNDS

Part III.—Formation of 2H-1,3-Benzoxazine-2H-(3H)-dione

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(Received July 30, 1970; revised September 1, 1970)

The vigorous reaction between phenyl isocyanate and methyl salicylare in the presence of triethylamine, has been reinvestigated and found not to yield diphenylurea or *N*-phenylurethan as hitherto claimed. The reaction is general for *o*-hydroxybenzoic acid or esters, and isocyanates (PhNCO), and it yields 3-substituted derivative of 2H,1,3-benzo-oxazine-2,4-(3H)-dione. The mechanism of the reaction is discussed.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

SYNTHESIS OF SOME NEW PYRONES

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PCSIR Laboratories, Peshawar

(Received June 18, 1970)

6-[(2-Furyl)vinyl-4-methoxy-6-[(2-thienyl)vinyl]-4-methoxy-α-pyrones and some related compounds were prepared to study their photochemistry. IR, UV and NMR data of these compounds is reported.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

FREE RADICAL INITIATED COPOLYMERIZATION OF MALEIC ANHYDRIDE WITH TRICHLOROETHYLENE

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PCSIR Laboratories, Karachi 39

(Received August 12, 1970)

Maleic anhydride (A) has been copolymerized with trichloroethylene (B) as such and also in presence of diluents at 70°C, using benzoyl peroxide as initiator. The copolymer obtained at high maleic anhydride concentration was as black as poly(maleic anhydride), whereas the colour of the copolymer obtained at lower maleic anhydride content was brown. The monomer reactivity ratios $r_1 = 3.7 \pm 0.2$ and $r_2 = 0$, have been calculated by using both integrated and differential forms of copolymer equations. Kinetic considerations show that the rate of copolymerization in benzene is faster than in acetic anhydride.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

THE NEUTRINO HELICITY

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(Received November 26, 1969; revised August 27, 1970)

Biological Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

CHEMICAL STUDIES IN THE GERMINATION METABOLITES OF PEGANUM HARMALA LINN

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The changes in alkaloidal, amino acid and carbohydrate constituents at various stages of growth of *Peganum harmala* seeds were studied in detail. The seeds were first extracted with ether to remove fatty matter and then exhaustively extracted with alcohol. From the alcoholic extract bases were isolated and the base-free fraction was studied for amino acid and carbohydrate contents.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

EFFECT OF SOLVENTS ON THE EXTRACTABILITY OF LIPIDS FROM LEAF PROTEINS

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(Received February 4, 1970; revised September 8, 1970)

The effect of solvents on the extractability of lipids of leaf protein concentrates and their composition was studied. Extraction with acetone removed most of the chlorophyll, triglycerides and some phosphatides. The mixtures of acetone—water extracted more lipids as compared with pure acetone. Treatment of leaf protein concentrate with acetone before extraction with chloroform—methanol resulted in a decrease in the total amount of lipid phosphorus and lipid nitrogen. The best extraction of lipids was obtained with 2:1 mixture of chloroform—methanol.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

CHEMICAL INTERACTIONS BETWEEN SEEDS OF COMMON SPECIES

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(Received May 15, 1970; revised August 12, 1970)

Chemical interactions between germinating seeds of 58 common species were studied *in vitro*. Five distinct types of chemical interaetions were recognized, i.e. one-way inhibition, mutual inhibition, one-way stimulation, mutual stimulation and both-way interaction. The predominant type of interaction was one-way inhibition.

Fifty-one species were found to be chemically reactive to some extent but only 9 species were highly reactive. All the reactive species can be classified into 6 groups, viz, exclusively inhibitory (16 species), mostly inhibitory (9 species), exclusively stimulatory (5 species), mostly stimulatory (4 species), mixed type (16 species) and mostly interacting both-way (1 species). Among the inhibitory species weeds and halophytes formed the majority.

The number of species found to be reactive was highest in plants of waste lands and alluvial plains.

The predominant interaction in plants of alluvial plains, saline soils and inland sand dunes was mostly inhibitory.

The plants of waste lands, dry stream banks and calcarious hills contained an equal number of inhibitory and stimulatory species. Lowlands flooded seasonally had mostly species producing mixed type of interaction.

The inhibitory interactions shown by a large number of species appears to have adaptive correlation with arid environment mainly by reducing competition between plants.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

EFFECT OF CALCIUM ON PERMEABILITY OF ROOTS OF PLANTS GROWN AT HIGH SODIUM CHLORIDE CONCENTRATION

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(Received July 14, 1970; revised August 20, 1970)

Effect of calcium on loss of inorganic and organic ions from the *Hordeum vulgare* was studied at germination and at the first leaf stage when these plants were grown in low nutrient solution containing high sodium chloride. The saline treatments resulted in greater loss of amino acids, Na^{24}, Cl^{36} and K labelled with Rb from plants receiving low Ca^{++} than from plants receiving high calcium in their growth medium. At low calcium, the greater loss of ions was due to increase in permeability of plant cells in this treatment.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

THE EFFECT OF MUTATED GENES ON THE GERM CELL FORMATION IN PISUM

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(Received February 9, 1971)

The meiotic behaviour of an X-ray induced mutant of *Pisum sativum* was analysed. The recessive gene causes a strong reduction of chiasmata frequency resulting in a varying number of univalents in the pollen mother cells. The later meiotic stages are highly abnormal and lead to genomically unbalanced nonfunctionable germ cells. The mutant is sterile in both sexes.

In the light of the present finding the "gene action system" of the meiosis in *Pisum* has been discussed. A total of 39 genes have so far been controlling this fundamental biological process.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

COMPARATIVE EFFECT OF PETKOLIN-M AND DDT ON THE RATE OF OXYGEN CONSUMPTION OF ADULT TRIBOLIUM CASTANEUM H.

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(Received September 23, 1970)

Effect of Petkolin-M and DDT on the respiration of *Tribolium castaneum* H. was compared. Both the insecticides initially increase the rate of oxygen taken up by the test insect but Petkolin-M less than DDT. The rate of respiration also increased faster with DDT. The toxicity tests indicate that petkolin-M is about 5–7 times less effective than DDT.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

STUDIES ON SOIL FUNGI

Part II.—Fungi from PCSIR Nursery Soil

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(Received June 2, 1970; revised August 7, 1970)

Studies were carried out to determine the fungus flora of PCSIR Nursery soil. Twenty-one species belonging to 14 genera were isolated from the soil. Five species have been reported for the first time from Pakistan which will be described elsewhere.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

STUDIES ON FRUIT ROT OF PAPAYA CAUSED BY RHIZOPUS ORYZAE (WENT. AND JEERL.)

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(Received June 8, 1970; revised July 27, 1970)

As a result of surveys undertaken in various papaya growing areas in south-west Pakistan, fruit rot fonnd ro be widely prevalent, mainly as a market disease. The causal organism was determined as *Rhizopus oryzae* (Went. and Jeerl.). Comparative pathogenicity tests showed that other species locally available viz. *R. nigricans* (Ehrenbag) and *R. arrhizus* (Fisher) could also cause the disease.

Studies made on the protopectinase activity of the pathogen showed that it secreted active protopectinase enzyme in the presence of pectin causing maceration of tissues in 3 hr.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

STUDIES ON STORED GRAIN FUNGI

Part III.—Fungi from Cereals

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(Received July 24, 1970)

Thirty-eight species belonging to 15 genera were isolatde from *Zea mays* Linn. (Pakistan), *Zea mays* Linn. (American), *Hordeum vulgare* Linn., *Sorghum vulgare* Pers and *Pennisetum typhoideum* Rich stored in various godowns in Karachi. About 83% of the organisms belonged to Fungi Imperfecti while Ascomycetes (15%) and Phycomycetes (2%) accounted for the remaining fungi. Species of *Aspergillus* were most predominant among all the fungi recorded and among these species *A. flavus* was the most prevalent organism. In *Zea mays* (American) damage was most severe because of the high moisture contents and increased temperature which resulted in the formation of "hot spots" and extensive damage. Surface sterilization of grains with 1:1000 $HgCl_2$ reduced the number of fungi considerably.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

UTILIZATION OF EGYPTIAN CANE-SUGAR BAGASSES FOR THE PRODUCTION OF CELLULASES BY ASPERGILLUS TERREUS THOM

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(Received May 29, 1970)

Cane-sugar bagasses contains about 60% cellulose and 0.2% reducing sugars. The spectroscopic detection of elements preseut in the ash of cane-sugar bagasses revealed that it contained sodium, potassium, magnesium, manganese iron, calcium and other trace elements. *Aspergillus terrcus* Thom utilized cane-sugar bagasses as carbon sources. The presence of cane-sugar bagasses in the fermentation medium induced the organism for the production of the cellulolytic enzymes (cellulases.) Cellulases were successfully precipitated and purified by cooled acetone from the fermentation broth. The hydrolytic activities of the precipitated crude cellulases were tested on sodium carboxymethylcellulose (CMC or Modocol M) and decreasing the percentage viscosity of Modocol M and appearance of reducing sugars which were taken as criteria for the cellulytic activities of cellulases showed that these enzymes could be produced by *Aspergillus terreus*, when cane-sugar bagasses were included in the fermentation medium as carbon source.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

INFLUENCE OF PHOSPHORUS ON THE FERMENTATION PRODUCTION OF CHLORTETRACYCLINE (CTC), COBALAMIN (VITAMIN B_{12}) AND ANTIFUNGAL ANTIBIOTIC AYF BY STREPTOMYCES AUREOFACIENS

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(Received Jnne 8, 1970; revised August 29, 1970)

An active strain of *Streptomyces aureofaciens* was studied for the fermentation production of chlortetracycline (CTC), an antifungal antiobiotic AYF and cobalamin (vitamin B_{12}). The organism could be used for the production of these compounds by regulating the phosphorus concentration in the fermentation medium, low phosphorus concentration was favourable for CTC production, medium phosphorus concentration initiared the organism for the production of AYF, while high phosphorus concentration was suitable for cobalamin biosynthesis. It was also found that phosphorus could control the productivities of the microbial mycelia for the fermentation production of CTC, AYF and cobalamin.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

NUTRITIONAL STUDIES OF ASPERGILLUS AWAMORI FOR THE PRODUCTION OF AMYLOGLUCOSIDASE

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PCSIR Laboratories, Lahore 16

(Received June 8, 1970)

Of all the strains of *Aspergillus* species *A. awamori* gave the best results of amyloglucosidase. The enzyme formation in general was sensitive towards medium composition. Penicillin waste mycelium greatly improved the amyloglucosidase formation than the other sources of nitrogen. The amyloglucosidase formation was decreased in the order of Penicillin waste mycelium, cornsteep liquor, $NaNO_3$, NH_4Cl, $(NH_4)_2SO_4$ and urea. Glucose was equally good source of carbon in the culture medium like yellow corn-flour.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

A NEW SPECIES OF ORATOSQUILLA (CRUSTACEA: STOMATOPODA) FROM ARABIAN GULF

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(Received June 24, 1970; revised September 22, 1970)

A new species *Oratosquilla arabica* (Crustacea: Stomatopoda), was collected during an ecological survey of Iraqi fauna from Arabian Gulf in April, 1968. The holotype male was described with stress on most distinguishing characters.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

MARINE FISH TREMATODES OF WEST PAKISTAN

Part IV.—Description of Three New Genera and Species

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(Received September 12, 1970; revised November 12, 1970)

Three new genera and species *Bicaudum otolithi*, *Qadriana fusiformis* and *Tritesticulum biovarium* are described from the fishes *Otolithus argenteus*, *Sciaenia glauca* and *Stromateus* sp. of the Karachi coast. The genus *Bicaudum* (Allocreadiidae, Diploproctodaecinae) is characterised in having bifurcated posterior extremity, delicate and transparent body divided into two regions, with the lateral edges of the forebody slightyl turned over ventrally but not fused posteriorly to form a scoop as in *Bianium*[5] Stunkard, 1930, pharynx and esophagus prominent, ceca terminate blindly near the posterior extremity, large vitelline follicles arranged in rows in posterior half of the body, immediately preacetabular median genital pore. The genus *Qadriana* (Hemiuridae, Lecithasterinae) is characterised in having well-marked preoral lobe, tubular postovarian vitellaria, post-testicnlar ovary, peculiar arrangement of urerine coils which are entirely extracaecal in postacetabular region, and intracaecal in the acetabular and preacetabular region, pyriform seminal vesicle and convoluted hermaphroditic pouch and genital pore ventral to oral suckar. The third genus *Tritesticulum* (Allocraediidae, Allocraediinae) can be differentiated from other genera of the snbfamily in having three posteriorly situated testes, prominent elongated seminal vesicle, ventrally placed marginal vitelline follicles, tubular oral sucker longer than acetabulum, and immediate preacetabular, median genita opening.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3 June, 1971

MARINE FISH TREMATODES OF WEST PAKISTAN
Part VI.—Two New Species of the Genus Prosorchis Yamaguti, 1934 (Hemiuridae: Prosorchinae*)

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(Received October 23, 1970; revised February 27, 1971)

Two new species of the genus *Prosorchis* Yamaguti, 1934, are described from the fish *Stromateus sinensis* Euph., of the Karachi coast. *Prosorchis stromatei* is unique in having three testes, two large intercaecal and one smaller almost extracaecal and connected by a fine duct with the posterior larger testes, long pars prostatica surrounded by numerous prostate gland cells and six convoluted vitelline tubes; four long extending posteriorly from the level of ovary to the posterior extremity, and two smaller extending anteriorly between ovary and acetabulum. *Prosorchis hexavitellatus* is very similar to *P. breviformis* Srivastava, 1936, as far as size of the body is concerned but is separated from it by having a sinus sac, six vit elline tubes, anteriorly dilated excretory arms, no cosphageal diverticulum, and smaller eggs.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

SYSTEMATICS AND BIOLOGY OF BRACHYMERIA BICOLORATA NEW SPECIES (Chalcididae; Hymenoptera) A Pupal Parasite of Earias Spp. in Sind, Pakistan

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(Received August 15, 1970; revised September 8, 1970)

Brachymeria bicolorata, new species is a primary pupal parasite of cotton boll-worm species *Earias insulana* and *Earias fabia* in southern areas of Sind province. The parasite is one of the commonly found chalcids, and successfully parasitises boll-worm pupae up to 20--30% in field populations. The life history of the parasite depends upon the environmental factors like temperature and humidity as well as on the physiological conditions of the host. The parasite is multifagous, and parasitises a number of the lipidopterous species.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

TWO NEW SPECIES OF THE GENUS ELASMUS WESTWOOD (Elasmidae:* Hymenoptera) parasitic on larvae of Earias spp. in Sind

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(Received September 17, 1970; revised November 19, 1970)

Elasmus Westwood is a well-known genus of the parasitic hymenoptera and belongs to the family Elasmidae. Its species usually occur as ectoparasites or hyperparasites. *Elasmus orientalis*, new species, and *E. dorsalis*, new species, being described hitherto are parasitic on larvae of *Earias insulana* and *Earias fabia*, both pests of cotton, okra and the wild plant *Abutilon* spp. The parasite completes a number of generations in a year, and a number of parasites are capable of developing on a single host larva.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

ON THE OCCURRENCE OF A LARVAL CESTODA (GYMNORHYNCHUS SPECIES) IN THE COELOM OF PAMA PAMA (HAMILTON, 1822) FROM THE RIVER PADMA AND MEGHNA

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(Received May 15, 1970)

Examination of 154 specimens of *Pama pama* from the rivers Padma and Meghna revealed the presence of a larval cestoda (*Gymnorhynchus* species) in the viscera. The incidence of the larvae was fairly common throughout the year (July 1966 to June 1969) but could not be correlated with the season. The infection intensity, however, was found slightly higher (3 3–3 7 worms per infected host) between June and November than that (1 3–2 6 worms per infected host) between December and May. Infestation by the parasite was never heavy and infected individuals looked healthy.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

THE NEOGENE FORAMINIFERAL BIOSTRATIGRAPHY OF EAST PAKISTAN

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(Received March 27, 1969; revised September 15, 1970)

The stratigraphy of East Pakistan with reference to its foraminiferal fauna is described. The exposed rocks of East Pakistan are post-Oligocene in age, although the oldest formations are encountered in subsurface drilling. Most of these formations are barren of foraminifera, except the Surma series which is characterized by nondiagnostic species of benthonic foraminifera referable to *Rotalia beccarii* group and few Miliolids. These species are characteristic of brackish water environments, thus it is inferred that the Surma series was deposited in a shallow brackish water environment.

Technology Section

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

FACTORS AFFECTING THE DESIGN OF A CHLORINATOR IN PHOTOCHLORINATION OF LOW-BOILING PETROLEUM HYDROCARBONS

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(Received May 20, 1970; revised July 1, 1970)

Photochlorination of low boiling petroleum hydrocarbons between C_4 and C_{12} (b.p. range 60–150°C), involving the study of the effect of the rates of chlorination, the mode of agitation and bubble size at the liquid-gas interphase, on the design of a commercial chlorinator where optimum conditions or values for these factors have been applied, is presented.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

STUDIES ON MODIFIED SHELLAC

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(Received April 3, 1970; revised July 7, 1970)

Investigations have been made for the utilization of indigenous shellac in paint industry after its modification. The product obtained by fusion of equal parts of modified shellac and epoxy resin at 150 °C for 20 min gave the best surface coating properties. The fused mass is soluble in methyl ethyl ketone and the baked film obtained from it has been found to be superior. The film after baking at 190°C for 10 min shows good bond, flexibility, appreciably high scratch value and good water and alkali resistance.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

UTILISATION OF DAMANI WOOL IN CARPET MANUFACTURE

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PCSIR Laboratories, Peshawar

(Received April 2, 1970)

Studies have been made on length, diameter, medullation, strength, resilience, lustre and colour of Damani wool fibres. These characteristics were compared with those of ideal carpet wool reported from abroad and also with those of local wools already considered by different workers to be of good quality for carpet pile yarn. The results show that Damani wool is almost ideally suited for manufacture of wool carpets.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

INTERRELATEDNESS AMONG NATURAL VARIATIONS OF THE LOW-CRIMP MIXED WOOLS

MUHAMMAD ASHRAF ALI

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(Received January 6, 1970; revised September 22, 1970)

Industrially significant attributes of the low-crimp 'mixed' wools are highly correlated with each other. In the ascending order of their importance the clean fibre yield shows significant correlatoin with specific compressional load, 'index of sulphur content' and the bundle tenacity. The tenacity is highly correlated with the index of sulphur content and compressional load. The load is similarly correlated with fibre diameter and sulphur index. The observed contrast betweeu their simple and partial coefficients of correlations, however, reveals a tendency of confounding certain fibre characteristics.

Pakistan J. Sci. Ind. Res., Vol. 14, No. 3, June 1971

PRELIMINARY OBSERVATIONS ON LOOSE WOOL FELTING TOGETHER WITH ITS FOLLOW-UP STUDY

MUHAMMAD ASHRAF ALI

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(Received April 7, 1970; revised July 1, 1970)

Certain inrtoductory studies indicate that the positions of the jars on a laboratory felting machine, the viscosity and volume of the felting medium largely affect loose wool felting rates which appear to be also influenced by an interaction between fibre type and the liquor volume. These effects primarily suggest the paramount role of the variations in compressive forces on the wool assemblies. A further comparisou employing two distinct estimators of loose wool felring rates seems to substantiate the trade opinion vis-a-vis the significance of fibre thickness and elasticity. Eventually, the variations of felting rates along the line of woollen manufacture signify some difficuity of predicting the felting shrinkage from observations at the preceding stages of processing.

SHORT COMMUNICATION
TECHNOLOGY **SECTION**

Pakistan J. Sci. Ind. Res., Vol. **14**, No. 3, 1971

A METHOD FOR THE DETERMINATIONS OF GRAPHITIC CARBON IN GRAPHITE ORES

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(Received June 20, 1970)