

# Government of Madras.

EDUCATIONAL DEPARTMENT.

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G.O. No. 122, 5th February 1916

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Report of the Dyeing Expert

Recording the — for the quarter ending the 31st December 1915.

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Report of the Dyeing Expert

Recording the — for the quarter ending the 31st December 1915.

GOVERNMENT OF MADRAS.  
EDUCATIONAL DEPARTMENT.

READ—the following paper:—

*Letter*—from K. T. B. TRESSLER, Esq., Director of Industries.  
*To*—the Secretary to Government, Educational Department.  
*Dated*—Madras, the 19th/20th January 1916.  
*No.*—B. 2.

I have the honour to submit the accompanying quarterly report of the Dyeing Expert for period ending 31st December 1915.

ENCLOSURE.

*Letter*—from Dr. F. MARSDEN, Ph. D., M.Sc., Dyeing Expert to the Government of Madras.  
*To*—the Secretary to Government, Educational Department (through the Director of Industries, Madras).  
*Dated*—the 12th January 1916.

I have the honour to submit my quarterly report covering the period October to December 1915.

Until the middle of November I was carrying on my work from the Leather Trades School, Washermanpet, then on receipt of Government orders proceeded to Bangalore to take up at the Indian Institute of Science the investigation of the indigenous dyeing materials which had been forwarded there.

The question of the resuscitation of the use of roots and barks, etc., which were generally employed before the advent of synthetic dyes has a fascination for many people and it is a difficult matter to convince them that the ever-extending use of factory-made products is not due to prejudice on the part of the dyer but is solely and entirely due to the fact that the manufacturers have studied his requirements, and with improvement succeeding improvement have made it possible for him to satisfy all tastes of the public as regards colour, and meet all demands as regards fastness, which can reasonably arise.

It is true that in India there is a large market for cheap dyes possessing nothing to recommend them but brilliancy of shade but these are not to be looked upon as the standard by which the achievement of the colour chemist should be gauged, for their discovery and manufacture date from the early days of the dye manufacturing industry and in Europe their use is restricted to those purposes for which they alone are suitable, and for every class of trade, for every textile fibre and for dyeing these at any stage of manufacture in suitable shades and degrees of fastness, synthetic dyes have long been available and have assisted in the creating of a textile industry in the midst of which one must live if its development is to be properly appreciated.

It was due to these considerations and the knowledge that the natural plant products could never meet the varied demands which had been created by the use of synthetic products that I have consistently tried to get others, who were not so much in touch with the industry and were without special knowledge of the conditions, to realize the futility of persevering in the idea that the plant products of the past could meet the demands which had been created by the developments of modern industry. We may regret it, but the fact is patent to any thinking unprejudiced person, and since business is conducted upon a basis of competition and guided by considerations of profit and loss those engaged in it will not lay much stress upon sentiment unless it is to their advantage to do so.

The sudden outbreak of the war however introduced a factor which had never been taken into account and in the early days it became evident that owing to the great hold which Germany had upon the dyestuff trade of the world we should, if the war lasted for any length of time, be faced with a dye famine. Therefore in August-September 1914, enquiries were started with a view to alleviating the position and the Agricultural department and certain Government officials were applied to for information with regard to the occurrence and cultivation of some of the better known indigenous dye materials of the past. The reply regarding the materials for red dyeing (the colour which is in greatest demand here) was not encouraging, for it was evident that there was no large area under cultivation and that a crop would take about three years to mature. There was, however, an uncertain quantity of material to be found in a wild state and in May 1915 the Director of Industries sent a request throughout the Presidency that samples of indigenous dye materials should be collected and forwarded to

him. The response was not encouraging but sufficient was obtained for the purposes of investigation and it was decided to arrange with the Indian Institute of Science for the facilities available in that institution to be utilized. The Director of Commerce and Industries, Mysore, was also interested and in the end when I received orders to proceed to Bangalore bulk samples of a large number of products were collected there.

These included—

| Dye materials.                | Tannin containing materials. | Diverse products |
|-------------------------------|------------------------------|------------------|
| Chay root                     | Divi-divi                    | Thandippa seeds  |
| Nuna                          | Myrabolans                   | Alum             |
| Vembadam bark                 | Acacia bark                  | Kassa leaf       |
| Munjeet                       | Leaves of Woodfordia         | Lime             |
| Red sanders wood              | Rorinunda                    | Etc.             |
| Sappan wood                   | Etc                          |                  |
| Cutch                         |                              |                  |
| Annatto seeds                 |                              |                  |
| Kapila powder                 |                              |                  |
| Lac                           |                              |                  |
| Indigo                        |                              |                  |
| Leaves of Wrightia-tinctoria. |                              |                  |

I had beforehand forwarded data with regard to the treatment of the more important materials and under the guidance of the Institute staff an assistant appointed by the Director of Industries and Commerce had made good progress with the investigation. Attention had been mainly devoted to chay root, as the material giving the dye most nearly approaching alizarin, but it was evident that the amount of dyestuff contained was less than that contained in European madder and, if anything deeper than a pink shade were to be obtained, it would necessitate the employment of a weight of roots some four times that of the cotton to be dyed, and this would mean a succession of dyeings upon the same lot of material. I have since been shown a report by an old dyer upon the process he used to employ and from this I see that to obtain a full shade of red he had to repeat the dyeing operation some 6–8 times according to the depth of shade required. So long as any alizarin is available there is very little hope of dyes employing chay root in quantity and the experiments made upon the extraction of the dye, as also upon the removal of non-dyeing principles to yield a more concentrated product, showed that the improvement which resulted was by no means commensurate with the extra expense involved. This question of cost of dyeing is all-important and I noted in *New India* some time since a statement by a correspondent that 500 lb. of madder root (I presume Indian madder) costing Rs. 155 would be required to dye a Madras red shade upon 100 lb. of cotton yarn and with alizarin selling at the time at 18 times more than pre-war prices the margin in favour of the synthetic product was Rs. 30 for cost of dye-material alone. Taking into account the extra expense for labour, increased amount of fuel and diminished production, the difference would be far greater than this. Even were the root able to compete as regards shade and cost of production the question of supplies is uncertain; Madras alone used alizarin equivalent to a supply of some 4 to 5,000 tons of roots per annum and since the commencement of the war some of the dyers there obtained a fair quantity of roots, hoping to keep their trade going with these. The result was most unsatisfactory as the extra labour required was considerable, the expense also was too great, and the shades produced were not equal to those obtained with alizarin. This last consideration would of course disappear in time, but so long as any imported alizarin is available or imported dyed yarns can be obtained by the weavers the ordinary market shades will be the standard and any others will not find a ready sale.

Chay root gives a rather bluer shade of red than alizarin, whilst nuna gives a yellower one. All are equally fast but the pure red of the alizarin dye is what is aimed at and the fact that the natural roots do not give this and require to be used in large quantities to obtain reasonably full shades are against them. There is the same difficulty with nuna as with chay root, the supplies of root are very small, as a crop it would take some three years to mature, and the price is high. The quotation I have is Re. 1 per 3 lb. of roots so that the dyeing costs would be almost identical with those given above for chay root and put the material out of court for commercial dyeing.

The possibility of using munjeet, vembadam bark, red sanders wood and sappan wood for red was investigated, but with munjeet the shades were too thin, and tending to orange on an alum mordant, vembadam bark gave shades which were too dull and insufficiently fast to permit of their extended application and with sappan wood and red sanders, although the former gave a bright crimson shade this is so fugitive to light that a day's exposure appreciably affected it and the latter gave only brownish shades for which there is no demand. The dyeing trials were made upon alum mordanted cotton as this is the mordant most readily obtainable by the Indian dyer; in Europe it was the custom to dye red sanders upon a tin mordant whereby a dull crimson was obtained but the expense of mordanting with tin salt is very high and it is not available to the Indian dyer, so it seemed out of place to suggest its use.

Were shades of a brown tone in favour here, catechu or cutch is a material which gives dyings fast to both light and washing when applied in combination with sulphate of copper and bichromate of potassium. It was largely used in Europe and the method of dyeing was well known but the shades upon the bundles of yarn we have dyed with this colour have not appealed to any dyer I have seen and I am certain that it will not be much used in the Presidency.

Anatto (Javira) seeds, kapila powder and lac are three products which dye bright shades upon the fibres to which they are applied, but whereas anatto is dyed both upon cotton and silk (seldom upon wool), kapila can only be dyed upon silk, and lac although very good colour for wool and silk can only be dyed in very thin shades (of uncertain fastness) upon cotton. The dyeing with anatto upon cotton is simple and especially upon bleached material the shade is rich and pleasing and although it is generally understood to be fugitive the trials I made convinced me that it is equal to the poorer aniline colours which are so much in demand.

The lac which I obtained was in the form of stick-lac and the dye was extracted by grinding and treatment with lukewarm water. The difficulty with this product is that the dye is often partially extracted by the people who collect the forest produce and the extract is evaporated and sold. The information as to the process of extraction is contradictory and this appears to vary in different parts of the country, in some places water alone being used whilst in others a little soda, lime or alum is added. For wool-dyeing the question is of little moment as there the dyeing is carried out with the addition of sufficient acid to decompose the lime or alum compounds, but with silk the best results can only be obtained by extraction with water alone.

In dyeing silk with kapila powder the country method is to use oil, soda and alum and although in this way full rich shades are obtained this is not because of the method of applying the ingredients, but in spite of it. Soda and alum are mutually destructive and the only rational way to dye this product is to prepare the dye bath with the soda and oil (or a little soap in place of the latter) and after completing the dyeing at a moderately high temperature to rinse and remove the residual alkali by immersing in a separate bath of dilute acid or of alum and again rinse before drying. The dyings made in this way were completed in a short time and left nothing to be desired as regards brightness and fastness of shade.

The only question with regard to the use of indigo, is that of supply and as it is stated that the leaves of the *Wrightia tinctoria* (the wood of which is used in toy-making at Chennampattu) were used as a source of blue dye the matter appeared worthy of investigation. The first sample of leaves received was somewhat dry and upon steeping there was no trace of dye-stuff development; when freshly cut leaves however were taken fermentation took place and appeared to follow a course similar to that with the ordinary indigo plant. It was noticeable however that strongly smelling organic-sulphur compounds were liberated and simple aeration of the fermented liquor produced little or no coloured deposit; addition of caustic alkali however to be freshly run off steeping water turned this to a deep yellow colour and this upon aeration became green. Neutralisation of the alkali by the addition of acid destroyed the yellow and left a bright blue colour in suspension. Rough quantitative trials showed that the amount of blue colour obtained depended almost entirely upon the time elapsing between the cutting of the leaves and steeping but the best yield indicated that the dye contents of the leaves were lower than in the ordinary indigo plant and the necessity of using a large quantity of alkali and acid in the extraction would make the product more expensive than indigo itself. Although the dye-stuff obtained from *Wrightia tinctoria* behaves like indigo in many respects I am not prepared to state that it is identical with ordinary indigo, for certain slight differences were noticeable in the experiments and above all the shade on a sample of yarn dyed by the ordinary vat method on a small scale has faded considerably within fourteen days, although only exposed to a very diffused light.

Of the other materials received it is only the tannin-containing ones which need be considered, lime, alum, kasa leaves, thandiappa seeds and such like products being merely assistants or developers with no tinctorial properties. In the majority of cases the tannin matters themselves which find application in dyeing are employed purely as assistants or fixing agents for other dyeing materials proper but sometimes advantage is taken of the coloured compounds they give with metallic salts to shade other dyes or even to produce a self-colour. The most important of these is undoubtedly the black compound with salts of iron, which is the basis of ink manufacture, and I have recently experienced how some Indian dyers have simply taken ink recipes as their guide and have attempted to apply the materials to yarn dyeing in a most unsuitable manner. One of the simplest recipes I have received is with ragi flour, iron, jaggery, kern and heera kasi (manifestly taken from the printing branch) but another is to take iron, mango seeds, myrabolams, divi-divi, "maful," alli leaves, nowsagar, herekay, palmrya jaggery, kallaganum bark and blanoo, place in cold water for eleven days and then boil until all becomes hard. Afterwards to add nowsagar, chunnam and mugambar when a good black is obtained, which however my correspondent finds "has no power." Seeing that the reactions have resulted in the production of an insoluble substance which cannot be made to penetrate the yarn I am not surprised.

All that is required to produce the black colour inside the yarn (where alone it is required) is to impregnate the material with the required solutions in successive stages.

First one soaks in a decoction of tannin matter (be it of gall nuts, myrabolams or divi-divi) and then, after simple wringing, work in a weak bath of milk of lime to fix the tannin.

It is necessary to rinse well to remove the excess of lime and then upon immersing in a solution of anna bedi (green coppers) the combination between iron and tannin takes place in the yarn, the bath remains clean and under control, and rinsing and drying complete the process. In many cases the treatment with lime is omitted but this results in the iron bath becoming highly discoloured and rapidly spoilt and only a greyish black shade is obtained upon the yarn, whereas after the lime bath it is easy to obtain quite a full black.

It is possible to improve the shade by topping with indigo, chay root, etc., but of course this increases the cost of dyeing and the shades are never equal to those with aniline black, sulphide and direct blacks, to which the trade has been accustomed.

The result of the enquiry has been to convince me that natural dyewares will find only a very limited application so long as imported materials of any kind are available, and a glance at the mill exhibits and the cloths of the people visiting the Peoples' Park exhibition is sufficient to demonstrate the impossibility of plant products competing effectively with the modern factory-made dyes. People engaged in the trade have up to now taken little or no interest in the use of these materials upon cotton and all the enquiries I have had have been for the supply of the imported dye-ware which were in use. Some dyers have asked what substitutes could be used and I have, wherever possible, recommended and given instructions for dyeing the iron-tannin black, alone or topped with indigo, red woods, or roots, and also cutch, but the range of shade is so limited and the demand for red which cannot be met is so large that the position is very little altered. It is true that small quantities of dyes imported from England are reaching Bombay, but no details are given as to the colours and no quantity appears to reach Madras, unless it is that they are red dyes and serve as the basis of the so-called "new" products to which I drew attention in my last report. This mixture of aniline colour, yellow ochre and water, is being offered all over the country, not so far as I see by any of the erstwhile dealers in dyewares but by to me unknown sellers who have taken up the business in the expectation of large profits. This exploitation may account for the high prices which are being paid for dyes at present for whereas the dyers throughout the Presidency (as proved by inquiry in the various districts) will not offer more than five to six times the pre-war prices, the dyes are selling at 20 to 25 those amounts. Diluted with yellow ochre and water to contain but a small proportion of effective dye the product if sold at Re. 1 per pound would yield a handsome profit to the dealer and although the regular dyer knows by experience the relation between value and cost and so far as I am aware is not buying this product, the weaver and small man may be purchasing to meet his requirements for coloured material and does not realise the poor value he is getting.

The samples I have received have been from people wishing to take up agencies and sell the stuff and from these I gather that it is not only the cheap Congo red which is being thus treated but also the more superior ones like the direct fast scarlets. It is certain that dyers who have any stock of dye find it more remunerative to sell the dye than to use it and I was informed by one man that the sale of one pound of dye was more profitable to him than the dyeing of one bale of yarn.

Under the circumstances, and as a result of the enquiries I have made, I am not of opinion that the dye cargo of the S.S. "Barenfels" should be purchased by Government, if the current market rate is to be gauged by the price which the material would bring if put up to auction. Mills and large concerns with big staffs and heavy expenses may find it better to pay such prices and keep going than to shut down, or speculators may buy and adulterate but it is certain that Government could not dispose of the dyes to the country dyer at the prices which would have to be charged.

The enquiries I have had in a few cases have referred to the fixation upon cotton of certain dyes which only draw easily upon wool and silk. The mordanting materials required are used by every dyer in the West, but very few Indian dyers seem to use them and appear to prefer the general method of fixation with alum which is not in this case very effective. Other enquirers have put questions upon the growing of indigo, but as in this branch I have no special knowledge the applicants were referred to the Agricultural department.

Order—No. 122, Educational, dated 5th February 1916.

Recorded.

(True Extract.)

P. RAJAGOPALA ACHARIYAR,  
Secretary to Government.

To the Director of Industries.  
Editors' Table.

EDUCATIONAL DEPARTMENT.

NOTES CONNECTED WITH G.O. No. 122, EDUCATIONAL,  
DATED 5TH FEBRUARY 1916.

[SUBJECT.—*Quarterly report of the Dyeing Expert.*]

*From the Director of Industries, dated 19th January 1916, No. B-2.*

The Director of Industries forwards the report of the Dyeing Expert for the quarter ending the 31st December 1915. During the greater part of the period Dr. Marsden was carrying on investigations in the utilization of indigenous dye-stuffs at the Indian Institute of Science, Bangalore. The report therefore deals generally with the same matter which has been explained by Dr. Marsden in his report of the investigations made at the Institute, submitted by him to Mr. Chatterton. While the latter refers in detail to the dyeing properties of the indigenous materials the former is more general. In view of the fact that the report submitted by him to Mr. Chatterton is to be printed and placed on the Editors' Table, it is for orders whether the quarterly report may also be printed and published as usual.

G.O. 115-16, Educational, 3rd February 1916.

S.K.—29-1-16.

There seems to be no harm in placing this report also on the Editors' Table. The last paragraph but one of Dr. Marsden's letter may, however, be omitted in the Editors' Table copies.

V.S.—29-1-16.

I agree.

P. RAJAGOPALA ACHARIYAR—1-2-16.

A draft order recording the report is submitted for approval.

S.K.—1-2-16.

V.S.—1-2-16.

P.R.—2-2-16.

[G.O. No. 122, Educational, dated 5th February 1916.]

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